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[PUBLICATION NO. 6]

THE ROCKEFELLER SANITARY COMMISSION

FOR THE

ERADICATION OF HOOKWORM DISEASE

HOOKWORM INFECTION

IN

FOREIGN COUNTRIES

OFFICES OF THE COMMISSION
WASHINGTON, D. C., U. S. A.
1911

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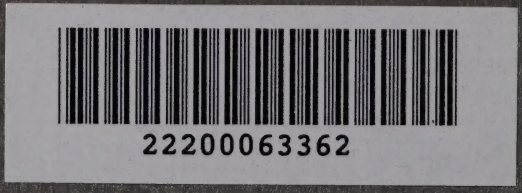
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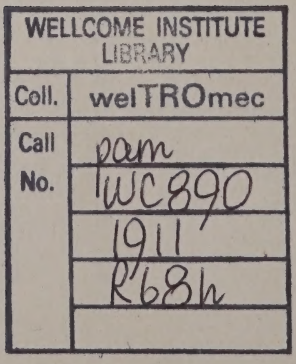

INTRODUCTORY NOTE.*

The Commission has undertaken to get information on hookworm disease in foreign countries. A letter was prepared asking for information on: 1, whether or not the country has been found infected; 2, the geographic distribution of the infection within the country; 3, an approximate estimate of the degree of infection; 4, whether the infection is surface or mine infection; 5, what is being done by private or public agencies to eradicate or relieve it. Through the good offices of the late Surgeon General Wyman this letter was sent out by the Department of State with a covering letter as an official inquiry to American representatives in all foreign countries. This was followed by correspondence with physicians and public health authorities in these countries; these reports were supplemented by reference to the voluminous literature of the subject on file in the library of the Surgeon General's Office, U. S. Army. The information thus gained is here summarized. The geographic distribution of the infection is exhibited on maps 1 to 6.

Some features of the exhibit call for special attention:

a. Extent of the infection.—Hookworm infection belts the earth in a zone about 66 degrees wide, extending from parallel 36° north to parallel 30° south; practically all countries lying between these two parallels are infected.

Of the foreign countries from which the Commission has received reports, 54 are infected. In six of these coun-

* This introduction is reproduced as summary in the Annual Report for 1911.

tries—Wales, Germany, Netherlands, Belgium, France, and Spain—the infection is wholly or chiefly confined to mines, and is found in but few definite localities; in at least 46 of these countries the infection is general and widespread. Tabular statement on page 86 shows that these 46 countries comprise an area of about 14,464,158 square miles and have a population of about 919,858,243. To this we may add 11 of our own States, with an area of 510,149 square miles and a population of 20,785,777. Of the total population of the globe—about 1,600,000,000 people in round numbers—about 940,000,000 live in countries where hookworm disease is prevalent.

b. Degree of infection.—In many countries the infection is extremely prevalent. In 1904 it was estimated that 90 out of every 100 of the working population of Porto Rico were infected. My own observations in the island convince me that this estimate was not excessive. The reports summarized in Publication No. 6 estimate: That of the whole population of Colombia living between sea-level and 3,000 feet above, 90 per cent are infected, and this includes the great majority of the 5,000,000 of people living in this country; that of the total population of British Guiana, 50 per cent are infected, the percentage of infection among the laborers on the sugar estates being much greater; that in Dutch Guiana the infection on many plantations runs as high as 90 per cent; that over a thousand microscopic examinations in French Guiana showed an infection of 35 per cent among a local population, 50 per cent among soldiers, and from 50 to 88 per cent among prisoners; that in Egypt general estimate places the infection at 50 per cent of the laboring population; that 50 per cent of the coolie laborers

on sugar and tea estates in Natal are infected, with the disease spreading among natives and Europeans; that on many plantations in Ceylon the infection runs as high as 90 per cent; that of the 300,000,000 of people of India, 60 to 80 out of every 100 harbor the parasite; that on rubber plantations in the Malay States the infection runs from 47 to 74 per cent; that the southern two-thirds of the Chinese Empire is involved with the infection in many places in the Yang-tse Valley running as high as 70 to 76 per cent among the farming population; that of the entire population of American Samoa, about 70 per cent are infected.

c. Economic significance of the disease.—The economic loss resulting from the disease is enormous. The physically sound coffee-picker in Porto Rico picks from 500 to 600 measures of coffee per day; scores of anemics told me they could pick only from 100 to 250 measures per day. According to estimates given me by the managers of a number of large haciendas in Porto Rico, the disease has reduced the average efficiency of the labor on these plantations to from 35 to 50 per cent. Dr. William M. McDonald reports that the disease is "sapping the life and energy of the population of Antigua." Dr. Parker, of Ecuador, says: "Last fall I visited one of the largest cocoa plantations near Babahoyo and found that the anemias of hookworm and chronic malaria made available not more than 33 per cent of work of the 300 laborers on that place." Dr. E. Brimont reports: "The disease has greatly retarded the development of French Guiana." The report from British Guiana says: "The economic loss due to hookworm disease on the sugar estates is heavy. On one estate, where the laborers were treated on a large scale, the manager reported that 'the

working power of the gangs had increased 100 per cent.'" The report from Colombia, after stating that the infection is among the miners and in abundant profusion throughout the agricultural sections, where the laborers on the coffee, sugar, rubber, tobacco, banana, and other plantations are seemingly all affected, says that "one of the greatest problems with which the people of Colombia are confronted at the present time is that of the evils attendant upon the presence of hookworm infection." Dr. T. F. McDonald, of Queensland, reporting conditions in the Johnstone River district, says that infection is present in every square mile of it, and that "it is sucking the heart's blood of the whole community." The Right Honorable the Earl of Crew, Secretary of State for the Colonies, in his dispatch on this subject to the Governor of Ceylon, says: "Having considered the reports from the several colonies, with the observations of the committee upon them, I recognize that the loss of labor caused by the prevalence of ancylostomiasis is very serious, and affects prejudicially not only the employers of labor, but the community at large. Not only is there serious loss of life, direct and indirect, but also through the invaliding of laborers the charges for hospital and pauper expenditures are largely increased." In 1908 Dr. Braddon examined 2,000 sick Tamils on the rubber estates in Negri Sembilan, Malay States, and says "there was no single one of these coolies who was not affected by ancylostomiasis"; "that 60 per cent of all coolies *at work* were in an advanced state of ankylostomiasis." Dr. Graham, reporting for Lower Perack, Malay States, says that more than 50 per cent of the entire population is infected and that the disease is of "great economic importance to the rubber industry."

In our own country Dr. Herbert Gunn, special inspector for the California State Board of Health, in his report on hookworm infection in the mines of that State, says: "There is no question that the general efficiency of the men is noticeably impaired. At one mine, employing about 300 laborers, it was stated that a reserve of about 25 men had to be available to replace those who, on account of sickness, did not appear for work. Quite a few of the men have to lay off every now and again to recuperate. Several who were unable to work stated that when they arrived in Jackson they were perfectly strong and well. A large number of these men were encountered on the streets, some of them presenting marked degrees of anemia. The greatest loss to mine operators is occasioned by the large number of those moderately affected. * * * A loss of 20 per cent in efficiency of those infected would be a conservative estimate. That would mean in Mine No. 2, for instance, where over 300 men are employed at an average of about $2.50 per day, and estimating the number of those infected as low as 50 per cent, a loss of over $20,000 a year."

This estimate is for *one mine*. Dr. Gunn reports "that infection undoubtedly is present in practically all of the gold mines of California. Infection is present, also, among agricultural laborers of that State."

But the infection in California is light as compared with nine or ten of our South Atlantic and Gulf States, with their 20,000,000 of people. If an infection of 50 per cent in one gold mine employing 300 men causes a loss conservatively estimated at over $20,000 a year, what must be the economic significance of this disease for India, with its 300,000,000 of people and from 60 to 80 per cent of them infected?

d. Retarding effect on education and civilization.—A photograph on file in this office shows a group of children, no one of whom until this year had ever been in a school; no member of their parents' family, of the grandparents' family, or their great-grandparents' family on either side had ever gone to school. We have in this family a record of at least four generations of illiteracy due to the disabling effects of hookworm disease. In the community in which this family lives are many other families showing a similar history. I have visited many communities in which a large proportion of the children have been kept out of school by disability due to this cause. I have visited schools and have on file records of many others in which all or a large proportion of the children attending are infected. Records of the definite survey show in extreme cases an average infection among rural children of school age for whole counties running as high as 70 to 90 per cent.

The statement by Dr. E. Brimont, that "the disease has greatly retarded the development of French Guiana," is applicable even in greater degree to many other countries. Acute disease may strengthen a race by killing off the weak; but hookworm disease is chronic. It works subtly through long periods of time, and its cumulative results—physical, intellectual, economic, and moral—are handed down as an increasing handicap from generation to generation. The letter on page 102, Second Annual Report of the Rockefeller Sanitary Commission, showing the effects of the disease on one community, is a statement in concrete miniature of what it means in the large. This letter portrays a situation which for our States is extreme; but many countries, like Egypt, India, and China, have suffered a heavy infection for cen-

turies, and its results have been handed down from generation to generation for ages as a cumulative handicap to the development of these people in all things that make for civilization.

e. Spread of the infection by immigration.—It is estimated that from 60 to 80 per cent of the total population of India are infected. Every country importing coolie laborers from India is bringing on to its own soil a heavy stream of infection. In Assam Dr. Bently examined 600 Indian coolies just arrived, and found only one of them free from infection. When the attention of the government at Durban was called to the heavy infection among the coolie laborers on the sugar estates of Natal in 1908, the authorities examined the next shipload of coolies from India and found 93 per cent of them infected. The Indian coolie is the chief source of labor supply for British Guiana; examination of all coolies arriving for the year 1909 showed an average infection of 74.44 per cent; this importation of coolie labor is regarded as the source of the present extremely disastrous infection in that country. About 16,000 Indian coolies have been imported into Jamaica, and it is estimated that 50 per cent of them are now infected. By the importation of coolie labor the infection has been carried and is being carried from India also into Dutch Guiana, Ceylon, the Federated Malay States, the Straits Settlements, and Java. The health authorities at San Francisco examined a shipload of Indian coolies just arrived at that port last year, found an infection of about 90 per cent, and established quarantine against further immigration of this type. Every group of Indian coolies now in California is a center from which the infection is spreading in that State. From

the outbreak of the disease in the St. Gothard tunnel the infection was carried into the mines of Austria, Belgium, and Germany. In these countries large sums have already been spent in a systematic effort for its eradication.

These, among a multitude of similar facts, suffice to show that hookworm disease, in the light of our present knowledge, has ceased to be a local matter; it is an international problem of serious proportions.

WICKLIFFE ROSE,
Administrative Secretary.

HOOKWORM INFECTION IN FOREIGN COUNTRIES.

I. AFRICA.

ALGERIA.

1. **Distribution of infection.**—Albert W. Robert, American Consul at Algiers, reports infection in the oasis of Hodna, Province of Algiers, and in the vicinity of the town of Mostaganem, Province of Oran.

Sergent and De Mouzon report a heavy infection in the Oasis Mdoukal, Province of Hodna, and add this suggestive information: "It is a standing custom of the inhabitants of Mdoukal to emigrate each year to the number of about 150 to seek work in the coast towns. They reside in these towns for several years, then after they have accumulated some money return to Mdoukal. All those in whose stools we discovered *Ancylostoma* eggs at Mdoukal had lived for several months at Algiers. * * * These poor people among whom we demonstrated a heavy infection traverse the whole of Algeria in their journeyings."

Thomas H. Kearney, in describing the workers in the date gardens of Nefta and Tozer in the Jerid, Tunis, speaks of the "lank forms and sullen anemic visages of the residents of the Jerid."

These date gardens in the oases are jungles of tropical growth abundantly watered by irrigation; the climate, the shade, the moisture, make an ideal incubator for the eggs and larvæ of the parasite. In these groves the natives work with bare feet and unprotected legs and hands. All these

facts taken together make it highly probable that the infection exists in practically all the oases throughout Algeria and Tunis.

2. **Degree of infection.**—Sergent and De Mouzon examined 7 anemics at Mdoukal and found 7 infected; they examined 8 persons taken at random showing no signs of anæmia and found 4 of them infected. The Consul at Algiers reports cases as "very common in the Hodna and erratic only near Mostaganem." Dr. Ferrier examined at Mostaganem about 100 persons and found 8 infected (Bull. Med. de l'Algerier, Alger., 1905, XVI, 482-488).

3. **Relief measures.**—Nothing is being done to relieve the present sufferers or to eradicate the disease.

BRITISH EAST AFRICA AND ZANZIBAR.

1. **Prevalence of the disease.**—Alexander W. Weddell, American Consul, reports that in British East Africa the disease has been recorded as present in Mombasa, Malindi, and Voi; that it is well known to the coast tribes under the name of "safura."

For *Zanzibar* he reports that for the six months ending June 30, 1911, there were reported 122 deaths from hookworm disease on the Island of Zanzibar. These deaths were distributed as follows:

Mkokotoni District (agricultural)	76
Mwera District (agricultural)	44
Chwaka District (many fishermen)	2
Total	122

2. **Preventive measures.**—According to the above report, routine treatment is given in the Government Hospital, Poor House, and prisons to natives showing pallor. For British East Africa the Government authorities say: "It is hoped that the schemes for sanitary improvement which are under consideration will result in the incidence of the disease being lessened."

EGYPT.

1. **Distribution of infection.**—The infection is heaviest in the Delta, but it is present in every province; it is confined chiefly to agricultural laborers; recruiting officers find it less severe among black troops. Dr. Looss reports finding only the *Ancylostoma duodenale* present.

2. **Degree of infection.**—No exact investigation to determine the degree of infection has been made; it is reported very heavy. (Department of Public Health of the Egyptian Government.) Of all autopsies at Kasr-el-Aing Hospital, Cairo, 90 per cent of cases were infected. (Dr. A. G. Salter.) General estimate places the infection at about 50 per cent of the laboring population.

3. **History.**—For centuries Egypt has been a center from which the infection has spread to other countries. A papyrus written about 3460 years ago gives an accurate description of the A. A. A. disease, which some authors interpret as hookworm disease. In 1833 Mr. Hamant reported its presence among the peasants and soldiers. In 1883 Sandwith is struck with the anæmia among the soldiers in the Cairo hospital. Treatment began in 1887. In

1894 Dr. Looss came to Alexandria and Cairo and later he worked out the life-history of the parasite.

4. **Conditions favoring the spread of infection in Egypt.**—Latrines unknown; laborers work all day with bare feet, bare legs and hands exposed to damp infected earth (F. M. Sandwith). Temperature makes this possible the year round.

5. **What is being done to alleviate or eradicate the disease.**—Treatment is given at the Government hospitals and dispensaries. Public latrines in the mosques are made as sanitary as possible; no general movement for its eradication.

GOLD COAST COLONY.

1. **Prevalence of infection.**—The British Secretary for the Colony reports: "Hookworm disease is prevalent in the Colony. The parasite *Necator americanus* appears to be existent rather than *Ancylostoma duodenale*. Its presence has been demonstrated in Fanti country, Akyem and Volta River District. Dr. Fisch, Basel Mission, estimates the degree of infection in Aburi as over 50 per cent in natives there, but there has been no official estimate. Workers in mines would appear to be little affected, the districts above mentioned being mostly agricultural; but cases have been recorded in Europeans working in mines."

2. **Preventive measures.**—The report continues on this point: "The steps taken are those of general sanitary principles in connection with washing places and latrines, and the question of applicability of the MacGregor principle is under consideration."

LAGOS.

1. **Prevalence of infection.**—Dr. Henry Strachan, Chief Medical Officer, reports the discovery of uncinariasis in Lagos*: "There is marked mortality among the natives from 'dropsy' and 'anæmia'. On seeing some of the cases so diagnosed, I was struck with the resemblance to the ancylostomiasis of the West Indies, and on examination the presence of the causative parasite was at once demonstrated." Treatment with thymol proved efficacious.

NATAL.

1. **Discovery.**—The presence of hookworm infection in Natal was first demonstrated by the discovery of hookworm eggs by Dr. Boufa of Tougatt in 1906. This discovery was repeated two months later by Dr. John J. Elliott, Indian Medical Officer at Verulam.

2. **Prevalence of the infection.**—The population of Natal consists of natives 700,000, Europeans 80,000, Indians 200,000. Investigations conducted by Dr. Elliott show:

(1) Of the coolie laborers on the sugar and tea estates about 50 per cent are infected.

(2) Of the Indian population at the port of Durban about 80 per cent are infected.

(3) From the 200,000 Indians the infection is spreading to the native kafirs. The infection is spreading from the coast inland.

(4) The infection is spreading among the Europeans.

3. **Conditions in Natal favoring the spread of the in-**

*J. Trop. M., Lond., 1898–9, v. I, p. 208.

fection.—Heat tropical in intensity; rainfall regular and plentiful on the plantations.

The Indian coolies are herded in barracks; they go barefooted and wear scant clothing; their idea of sanitation and personal cleanliness is of the most elementary; it is a prevailing custom to keep wholesale scavengers attached to the barracks in the shape of swine, hens and muscovy ducks; the children, barefooted and bare-bodied, play in the filth around the barracks, become heavily infected and cannot be made to conform to sanitary regulations.

The 700,000 native kafirs are herded in great "locations" or "settlements". They are being brought into closer and closer relations to the Indians and the infection is spreading among them. Indian traders and free farmers circulate freely over the whole colony.

"The open life led by Europeans in Natal, the dwelling in tents in the hot season, and in beach residences with imperfect closet arrangements, the al fresco habits of Indian servants attached to households, the custom of allowing white children to run barefooted or sandaled, all contribute toward the spread of the disease among Europeans."

4. **Origin of the infection.**—Dr. Elliott of Verulam and Dr. Turner of Johannesburg attribute the spread of hookworm infection in Natal and Southeast Africa to the importation of coolie laborers from India. The 200,000 Indians in Natal represent the results of an unchecked immigration mainly from Calcutta and Madras for 40 years. A recent report states that the great majority of the whole native population of India is infected with hookworm disease. The infection was first discovered in 1906 among the Indian coolies; further examinations showed heavy in-

fections all along the coast from Cape Colony to Zulu. It was discovered later that immigrants fresh from India showed heavy infection. In 1908 the attention of the Government of Natal was called to the fact that recent shiploads had shown a large percentage; the Health Department examined the next immigrant ship and found 93 per cent infected.

Dr. Turner in a report giving the results of post-mortem examinations of natives newly arrived in Johannesburg shows no infection found among the natives living in Cape Colony, Orange River Colony, Transvaal, Bechuanaland, Basutoland, Matabele and Mashona; but of the natives from seaport districts the infection is heavy, the percentage of infection of all those examined being for the Mozambique Tribe 64; Quillemane 64; Beira 100; Nyassa 54; Myambaan 35; Shangaan 35; British Central Africa 25; Angoni 18. These facts are interpreted as indicating that the infection is from India; that it is spreading in Africa along the seaboard and thence inland to the native races by contamination by Indian traders and coolie laborers.

5. **What is being done to control the infection.**—When in 1908 the Government of Natal was advised by the Health Department that of the immigrant ship inspected 93 per cent were found infected, a cabinet meeting was called and it was decided to send the shipload back to India. This was abandoned for the reason that to be consistent every infected sugar and tea estate in the colony would have to be cleared of its Indians and this was too big an undertaking. The ship was quarantined for months; succeeding ships have been held in quarantine by the Government. The Colonial Health Department has thus made itself very un-

popular with the planters of Natal. On the estates the coolies are being treated. Latrines are supplied at many of the barracks but the regulations for their use are not lived up to, the children especially resist regulations and the workers persist in polluting the soil in the cane fields. During the year 1911 all infected immigrants have been given one course of treatment before being assigned to estates. (Information by A. B. Stewart, American Consul at Durban.)

SIERRA LEONE.

1. **Distribution of infection.**—The Colonial Secretary reports that, up to the present, infection has been found only at Freetown; here it is common among the poorer classes.

2. **Degree of infection.**—Data insufficient for an approximate estimate of degree; infection is reported as "common among poorer classes" at Freetown; as not seeming "seriously to trouble the inhabitants."

3. **Relief measures.**—Nothing is being done to eradicate the disease.

TUNIS.

1. **Distribution of infection.**—Doctors E. Gobert and G. Gatouillard in describing the inhabitants of South Tunis say: "The traveler who goes for the first time into the oases of Tozer, of El Oudiane, or of Nefta is struck at once by the physical decadence of the population and the great number of extreme anemics that he meets. These anemics are very often inveterate dirt-eaters. It was the discovery of this that led us to make a systematic investigation for *Ancylostoma.*" This investigation demonstrated the pres-

ence of infection at these places. Dr. P. Sonsino demonstrated the presence of hookworm at Gabés and at Gafsa.

This later report confirms the judgment expressed when describing the date gardens of the Jerid in connection with conditions in Algeria. (See Distribution of Infection in Algeria.)

2. **Degree of infection.**—There has not been sufficient investigation to justify an estimate of the degree of infection. Gobert and Gatouillard examined 107 persons and found 22 of them infected; only one slide was examined in each case; clearly the percentage of infection was much heavier. They found also a heavy infection of other intestinal parasites. The dirt-eating habit among these people is extreme; 60 per cent of those found infected were confirmed dirt-eaters. The dirt-eater keeps a large store of his choice dirt at his house and carries a small bit with him wherever he goes.

3. **Relief measures.**—Nothing is being done to alleviate or eradicate the disease.

II. THE AMERICAS.

ANTIGUA.

1. **Distribution of infection.**—In 1897 Dr. Galgey of St. Lucia, reported the disease as endemic and prevalent all over the West Indies. Dr. H. A. A. Nichols (1900*a*), of Dominica, quotes the statement with approval;* he reports further that infection is not uncommon in Dominica, but on account of sparse population and an abundance of pure running water the chances of infection are much less than in Antigua; that infection is extremely prevalent in Antigua; that conditions indicate that it has been here for a long time and is the same as the "negro cachexy" described by early physicians.

2. **Degree of infection.**—In the light of present knowledge the degree of infection cannot be stated in terms of percentages. Dr. Wm. M. McDonald (1900*a*), Acting Medical Superintendent at Halberton Institute, Antigua, states that within 13 months he had in the hospital 148 cases; that these were extreme; that all had been unable to work for from 6 to 12 months; that 34 of them died; that the disease is sapping the life and energy of the laboring population of Antigua.†

3. **Conditions favoring spread of infection.**—Dr. McDonald states that the population is dense; that the water supply is the worst, being dirty pond water; that all cane fields are open latrines; that during rains, the wash from

* J. Trop. M., Lond., 1900, v. 2, p. 247.
† J. Trop. M., Lond., 1900, v. 2, p. 297.

these cane fields finds its way into the ponds that supply drinking water to the natives. To this may be added the tropical climate and the habit of going barefooted the year round.

4. **Relief measures.**—According to Dr. McDonald nothing is being done to relieve the situation. Even the sick are not properly cared for. He has reported the situation to the Government.

ARGENTINA.

1. **Disease not prevalent.**—The American Consul at Buenos Aires, R. M. Bartleman, submits a communication from the National Department of Hygiene, stating that in the Federal Capital statistics have been kept of about 31 cases of hookworm disease; that these are imported cases; that the disease does not exist in Argentina.

BARBADOS, W. I.

The American Consul at Barbados reports:

1. **Distribution of infection.**—"The country is infected. The districts chiefly infected are the Parishes of St. Andrew, St. Joseph, and the lower part of St. John, but occasionally cases occur in the other parishes. * * * Infection is agricultural."

2. **Degree of infection.**—"In the absence of reliable statistics an approximate estimate of the degree of infection can not be given, but the number of cases is not great, or at any rate, the cases that present severe symptoms."

3. **Relief measures.**—"Ordinary sanitary by-laws are enforced as far as possible but no special measures are directed against the disease."

BRAZIL.

1. **Distribution of infection.**

a. Para: Consul George H. Pickerell, at Para, reports: "Hookworm infection undoubtedly exists in the whole Amazon River District. This opinion is based upon our local hospital practice, the hospitals accepting persons coming from interior points or other states." He says that the infection is agricultural; that there are no mines.

b. Bahia: Consul S. P. Warner, Bahia, reports that "hookworm infection is general throughout the state of Bahia, especially among the lower classes"; that the infection is agricultural.

c. Sao Paulo: Paulo R. Pestano, Director of Commerce and Industry, at Sao Paulo, reports that hookworm infection in the state of Sao Paulo is most prevalent in the regions traversed by the Sorocabana, the Paulista, and the Central of Brazil railroads; that the infection is agricultural. Consul Jay White, at Santos, submits a map showing the infection to be distributed over practically the whole state.

d. Brazil as a whole: Dr. Sampio Vianna, for the Director General of Public Health at Rio de Janeiro, says that hookworm infection is observed in almost all the States of Brazil; that the disease is most prevalent in the northern and central regions. Mr. Lay, Consul General at Rio de Janeiro, writes: "This disease exists throughout a great section of the nation of Brazil."

2. **Degree of infection.**—The degree of infection cannot be definitely stated on the basis of available data. The infection is reported as heavier in the northern and central regions; in a state as far south as Sao Paulo, 151 of the

171 counties of the state reported deaths from hookworm disease for 1910. For 1909 there were 478 deaths from hookworm disease reported for the state of Sao Paulo; these by municipalities were: Taubate, 41; Sao Jose dos Campos, 36; Santos, 32; Jaher, 26; Beheduro, 23; Soccorro, 15; Botucatu, 10; Dais Corregos, 9; Barretos, 8; Agudos, 7; Bariry, 8.

3. **Relief measures.**—The Brazilian Government, acting on the vote of the Fourth Latin-American Medical Congress, held in Rio de Janeiro in 1909, has recommended through the General Department of Public Health the following preventive measures:

a. Protection, by the use of boots, of mine workers and all who handle brick, pottery, earth roofing material, etc., and all persons engaged in agriculture.

b. Disinfection of the excrement of persons infected with hookworm disease.

c. Disinfection of mines, of factories, and of the yards of farmers.

d. Isolation and treatment of infected persons, who should not be allowed to return to work until the stool is free from eggs of the parasite.

BRITISH GUIANA.

1. **Distribution of the infection.**—The whole of British Guiana is infected with hookworm disease. Infection is heaviest on the sugar estates which occupy practically the whole coastal area. It is agricultural mainly.

2. **Degree of infection.**—It is estimted that about 50 per cent of the population of the Colony are infected. (Robert

A. Crance, American Vice Consul.) The percentage of infection among the cooly laborers on the sugar estates is much greater. Of the Indian immigrants brought into the country in 1909, 74.44 per cent were infected. (W. F. Law, M. D., Medical Inspector.) On one ship this year (1911) the infection was 78.5 per cent. This immigration from India is the chief source of labor supply for the sugar estates.

3. **Origin of infection.**—It is not known whether there was any infection in the Colony before the importation of cooly labor from India; there is no evidence of its existence there previous to this time. The bulk of the labor supply for British Guiana consists of East Indians brought to the country under indenture. This immigration is bringing into the country a constant stream of new infection.

4. **Economic significance of the disease.**—Dr. Law, the Government Medical Inspector reports the economic loss due to hookworm disease on the sugar estates as heavy. On one estate where the laborers were treated on a large scale the manager reported that the working power of the gangs had increased 100 per cent.

5. **What is being done to alleviate or eradicate the disease.**—In 1888 Dr. Griem called attention to the existence of hookworm infection in British Guiana; since that time the subject has received increasing attention. From 1904 to 1908 about 39,000 cases were treated in the estate hospitals. In 1908 the Governor advised the estate owners that in future allotment of immigrants might be made conditional on the provision of suitable latrine accommodations. In his report for 1910 the Government Medical Inspector says:

"This mild compulsion has had such a good effect that now practically every estate has a good and effective latrine system, and planters who were formerly my strongest opponents are now firm believers in the usefulness of proper sanitary accommodations for their laborers."

In this same report the Medical Inspector calls attention to the new infection introduced by the immigrants; he says: "Last season was the worst we have as yet experienced in this direction, 74.44 per cent of the immigrants having been found infected on arrival. * * * Measures should certainly be taken either in India or on board ship to treat these cases, otherwise we shall be compelled in self-defense to isolate every one on arrival."

BRITISH HONDURAS.

1. **Distribution of infection.**—J. H. Hugh Harrison, Colonial Surgeon, reports* that hookworm infection plays an important part in the death rate of the colony; that infection is general through the colony; that it seems to be especially heavy along the banks of the Belize river and extending up to the frontier and also in the northern districts; that cases came to the hospital from Placencia, in the south, from Bacalar Chico in the north, and from so many places distributed over the Colony as to settle the question that infection is most general.

2. **Degree of infection.**—Dr. Harrison reports: "Postmortems have demonstrated the fact that these parasites were present in about 70 per cent of the cases." Beyond such hospital work no systematic survey has been made.

* J. Trop. M., Lond., 1909, v. 12 (18), p. 275.

3. **Conditions favoring spread of infection.**—The people of the Colony, for drinking water and for bathing purposes, avoid running streams and prefer standing pools, which they say are collections of pure rain water. These pools are polluted. To this are added a tropical climate, primitive sanitary habits, and the custom of going barefooted the year round.

4. **Relief measures.**—The cases that come to the attention of private practitioners are being treated. No systematic relief measures have been adopted; the people are ignorant even of the presence of the disease.

COLOMBIA.

1. **Distribution of infection.**—Charles H. Small, vice and deputy Consul General at Bogota, reports that the great majority of the inhabitants of Colombia, the population of which is estimated at 5,000,000, live in the lowlands, where the temperature is between 60° and 100° Fahrenheit and the altitude varies from sea-level to perhaps 3,000 feet above; that it is reliably stated that nine out of every ten persons living in these districts are afflicted with hookworm disease; that the infection is among the miners, and is in abundant profusion throughout the agricultural sections, where the laborers on the coffee, sugar, rubber, tobacco, banana, and other plantations are seemingly all affected; that the parasite is also found in the higher regions, such as the plateau of Bogota, 8,000 feet above sea-level; but, on account of the cool climate, the infection in these higher regions is light.

2. **Degree of infection.**—On this point Mr. Small says: "In general, it may be stated that, with the exception of that

portion of Colombia situated at a greater altitude than 3,000 feet, the entire country is infected with hookworm, and that within the infected areas about 90 per cent of the inhabitants are victims of the pest."

3. **Conditions favoring the spread of the disease.**—This report continues: "The swampy, damp regions, filled with decomposing vegetable matter, and which predominate throughout the lowlands of Colombia, offer a fertile field for the increasing growth of the hookworm, especially in view of the fact that the native inhabitants of these districts are but little inclined to the practice of hygienic or sanitary measures of any kind."

4. **Relief measures.**—On this point Mr. Small says that, "according to the most prominent Colombian scientists, one of the greatest problems with which the people of Colombia are confronted at the present time is that of the evils attendant upon the presence of hookworm infection"; that "thus far the Government officials of this Republic have taken no official cognizance of the hookworm infection as a menace to the health of the people and its retarding effects upon national progress"; that the investigations thus far made have been made by public-spirited physicians and scientists, and that they have all arrived at practically similar conclusions. "It is hoped," he says, "that in the future either the Government or some philanthropic organization will provide funds to be employed in a scientific and systematic attempt to eradicate this pest."

DOMINICAN REPUBLIC.

1. **Distribution of infection.**—F. M. Endicott, Consul General at Santo Domingo, reports that the greatest number of cases exist in the heart of the Cibao Province, where the population, entirely rural, is most widely infected; that in the province of Sabana de la Mar the disease has made rapid progress; that, with the exception of the southern portion of the island, the entire country is infected; that the infection is agricultural; that in the Cibao district the larvæ find conditions most favorable to their development; and that the natives earning their living solely from the cultivation of cocoa walk barefooted through the plantations and get the germs of the disease.

2. **Degree of infection.**—The degree of infection cannot be stated at present in percentages. Mr. Endicott reports on this subject: "It appears certain that it is spreading, and, far from decreasing, continues steadily on the increase. Certain regions where the disease had never been reported are at present infected. This could hardly be otherwise, as no hygienic precautions have been taken, and the natives of the country are completely ignorant of the most elementary laws of hygiene. The districts which have suffered most from this disease may be named in the following order: The Cibao Province, Sabana de la Mar, and the Seybo district."

3. **Preventive measures.**—There are none. In 1906 Dr. Defillo wrote in the Revue Dominicaine: "In view of the magnitude of the peril I have not been inactive. I duly informed the Minister of War of the serious fears I entertained of the spread of this disease. * * * If those

whose duty it is to watch over the public health shall not take all possible measures to check the invasion of hookworm disease, in a short while it will spread and produce among our countrymen as great ravages as it has already done among other peoples." Mr. Endicott says that no preventive measures have been adopted, and that the disease has spread.

ECUADOR.

1. **Prevalence of hookworm infection.**—Dr. Herman B. Parker, Passed-Assistant Surgeon, U. S. Public Health and Marine Hospital Service, reports under date of May 17, 1911:

"On my arrival in Ecuador I was impressed with the severe anemias that prevail here, and, shortly after the arrival of my laboratory outfit, verified the cause of these anemias as hookworm infection. I have not conducted any investigation as to the actual presence of the parasite outside of Guayaquil, but in the places visited I have met with the same severe clinical type of anemia that characterizes this infection.

"I noticed this anemia more particularly in the coast towns of the Province of Manabi, where the towns are built on or close to the sandy shores of the Pacific and have a primitive sewage disposal and a common unprotected water supply. Fishing, agriculture, and a small amount of commerce are the principal pursuits of those places."

There are few mines in Ecuador, and these are remarkably free from all infection, due to modern disposal of sewage and safe supply of drinking water.

"Regarding the altitudes," continues Dr. Parker, "a most interesting condition is met with; here the natives, more

particularly the Indians, are of a distinct physical type, being free from the anemias that characterize the lowlands, having clear complexions with rosy cheeks, showing the apparent absence of these infections."

2. **Economic importance of the disease.**—Dr. Parker reports: "Last fall I visited one of the largest cocoa plantations near Babahoyo and found that the anemias of hookworm and chronic malaria reduced the efficiency of the 300 laborers on that place to not more than 33 per cent."

3. **What is being done to eradicate the disease.**—Dr. Parker writes: "Nothing, by either public or private agencies, is being done to alleviate or eradicate the disease."

FRENCH GUIANA.

1. **Distribution of infection.**—Systematic examinations of prisoners and soldiers made by Dr. E. Brimont indicate that infection is general throughout French Guiana.

2. **Degree of infection.**—The degree of infection is indicated by the following results of Dr. Brimont's examination:

a. Prisoners at Saint-Laurent: examined, 406; infected, 71.92 per cent.
b. Prisoners at Saint Jean du Maroni: examined, 233; infected, 73.39 per cent.
c. Prisoners at Iles du Salut: examined, 157; infected, 50.95 per cent.
d. Prisoners at Cayenne: examined, 63; infected, 88.88 per cent.
e. Local population at Saint-Laurent: infected, 35 per cent.
f. Soldiers: total number examined not given; infected, 50 per cent.

The report further states that the disease has greatly retarded the development of French Guiana.*

3. **Relief measures.**—No report on this subject.

GUATEMALA.

1. **Distribution of infection.**—The fact that hookworm infection has been demonstrated in all the States of southern Mexico, in British Honduras, Honduras, and Salvador, would indicate that the whole of Guatemala is involved. The presence of hookworm infection in Guatemala was first announced by Dr. H. Prowe in 1889. His later investigations demonstrate a prevalent infection. He reports (1899*a*) that the infection seems to be most prevalent along the coast among the neighboring hills, and in the high valleys of the Cordillera; that in different parts of Guatemala he has met with many hundreds of cases of the disease.

2. **Degree of infection.**—The following records of investigations by Dr. Prowe serve as a rough index to the degree of infection:

a. Hospital at Ritalhuleu, Guatemala, September, 1893, to March, 1894: of 522 patients received, 246 had hookworm disease.

b. Of 83 autopsies, hookworms were found in 46 cases; in 25 of these cases it was the sole cause of death.

c. On a coffee plantation, during 28 months 1,286 sick people were under care; of these, 528 had hookworm disease; 43 of these cases died of the disease.

3. **Relief measures.**—No report on the subject.

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* Arch. de parasitol., Par., 1906, v. 10 (3), p. 459.

* Arch. f. path. Anat. [etc.], Berl., 1899, v. 7 (3), pp. 458–474.

HONDURAS.

1. **Distribution of infection.**—Claude I. Dawson, American Consul at Puerto Cortes, reports that hookworm infection prevails to a considerable extent throughout Honduras; that the infection is general, but is most prevalent in the interior and coast agricultural districts; that it is not frequently seen along the extreme north coast. Infection is rural and agricultural.

2. **Degree of infection.**—No systematic investigation has been made in Honduras. Mr. Dawson quotes an American physician on the northern coast as follows: "In this immediate section of the country it is extremely rare. In looking over my case records I find I have had only two cases in the last ten years. In the interior towns and rural districts there is a complete absence of all sanitary precaution; consequently the soil is polluted, and from data supplied to me by physicians in the interior I know that certain districts are badly infected and the disease is common and widely distributed."

3. **Preventive measures.**—Mr. Dawson reports on this point: "The government has taken no notice of the disease, nor have any steps, either private or public, been taken to alleviate or eradicate it. In fact little attention has been paid to its diagnosis among those seeking medical treatment for obscure cases of pernicious anemia. The fact that a few foreigners were unsuccessfully treated for anemia and later treated for hookworm disease in the United States and entirely cured has called the attention of physicians to the necessity of correctly diagnosing the case."

JAMAICA.

1. **Distribution of the infection.**—The superintending medical officer of the colony reports that: "Hookworm disease does exist in Jamaica. It has been reported as existing in the following parishes or parts thereof during the last financial year: St. Andrew, St. Thomas, St. Anns, St. James, St. Elizabeth, Portland, Westmoreland, Clarendon. It is found chiefly among East Indians, although also to some extent among creoles; of some 230 cases reported in one district nearly 100 were among East Indians."

2. **Degree of infection.**—The population of Jamaica is estimated to be about 862,000, of whom about 15,000 are whites, 16,000 East Indian coolies, 150,000 "colored," 5,000 not classified, and the rest negroes. Of the East Indian coolies it is estimated that about 50 per cent are infected. The new arrivals bring the disease with them from India.

3. **Relief measures.**—The superintending medical officer reports: "An order has been issued that as a routine practice all admissions to hospitals whose symptoms are at all suggestive of hookworm disease shall be treated therefor. I may say that the Malaria Commission, of which I am a member, is now collecting reports with a view to consider what measures can be taken to alleviate, reduce, or eradicate the disease." All coolies suffering from any disease are given free treatment in government hospitals.

MARTINIQUE.

1. **Distribution of the infection.**—The Director of the Health Service at Martinique reports: "The disease is prevalent throughout the country, especially in localities where

the people drink water from certain ponds." The parasite found is *Necator americanus.*

2. **Degree of infection.**—No information available. Thomas R. Wallace, American Consul at Fort-de-France, writes: "The inhabitants of Martinique are just beginning to be informed of the existence of hookworm and the conditions resulting from its infection."

3. **What is being done to eradicate the disease.**—

(1) The officials of the Health Service are spreading information on the subject by means of printed matter and by public meetings in the country.

(2) Regulations have been issued controlling the disposition of night soil.

(3) In 1909 a Hygiene and Microbiology Institute was established for the free treatment of transmissible diseases.

MEXICO.

1. **Distribution of infection.**—Dr. J. W. Colbert, of the Santa Fé Hospital, New Mexico, reports: "I have made an extensive study of this condition in Mexico, and have found the infection in the states of Lower California, Sinaloa, Queretaro, Guanajuato, Michoacan, Chiapas, Vera Cruz, Guerrero, Oaxaca, and Yucatan." Dr. Ricardoe Manuel, of Mexico, reports infections in Hidalgo, Tamaulipás, Guerrero, Michoacan, Zacatecas, and Guanajuato. Dr. W. C. Alvarez, of Cananea, Sonora, Mexico, confirms these reports as follows: "So far, cases have been reported from almost all the most southern Mexican states from the Isthmus of Tehuantepec and Yucatan to the states just above the City of Mexico. No case has yet been reported from

the immense northern states of Coahuila, Chihuahua, Sonora, and Durango. As these states have a more temperate climate and severe winter, owing to their great altitude above sea-level, the hookworm may never get hold on the higher plateaus."

2. **Degree of infection.**—Dr. Alvarez reports the disease as "very prevalent in the mines of Santa Rosalia, Lower California, and says the whole west coast appears to be heavily infected. Dr. Colbert reports: "I have examined a group of 114 Mexican laborers just received for section work on the Santa Fé Railway, and I found 13 of the men infected with hookworm." Dr. Luis R. Laru estimates infection in the mines of the Real del Monte and Pachuca at 50 per cent.

3. **Origin and spread of the infection.**—Dr. Manuel finds that "all the worms observed so far in Mexico are of the old-world type," and believes that the infection was introduced by foreign miners and has spread by the floating mining population. Dr. Colbert, on reporting finding 13 infected persons in a squad of 114 Mexican laborers, says: "I was informed that between two and three hundred of these men were received in El Paso every day for work on the various railroads of the country, and I believe that these Mexican laborers are responsible for the many cases coming to our notice thoughout the West, the Middle West, and Southwest."

4. **Relief measures.**—Dr. Alvarez writes: "Nothing at all is being done, and, unfortunately, there seems to be no recognition of the disease by the local physicians, who for the main part are very poorly educated, and none that I have met use microscopes."

Reports from the public health authorities in many of the States indicate that there is but little local knowledge of the disease.

NICARAGUA.

1. **Prevalence of infection.**—Dr. M. S. Lane, graduate of a medical school in Ontario, Canada, and a practicing physician in Bluefields, reports: "This coast, or the Department of Bluefields, is certainly infected. Referring to my notes, I find I have attended the following cases: 6 cases from Cape Gracias and district; 7 cases from Prinzupulcu and district; 13 cases from Rio Grande and mahogany camps; 27 cases from Pearl Lagoon district; 110 cases from the town of Bluefields—part of these lived here; some came from banana plantations on Escondido River, Cukra district, and Rama Cay. My cases have been all from agricultural districts."

2. **Degree of infection.**—On this point he says: "I am unable to answer this question intelligently, not having the proper data, but I should judge that the percentage of cases is small."

3. **Relief measures.**—"Only what the individual physicians of Bluefields do in treating individual cases and advising as to sanitation and prophylaxis. There is no health board here."

PANAMA.

1. **Distribution of infection.**—The infection is general throughout the Republic of Panama. Prevalent among agricultural classes and natives in general; both the new-world and the old-world species present.

2. **Degree of infection.**—Alban G. Snyder, Consul General at Panama, reports: "Infection general and to the approximate degree of 20 per cent."

3. **What is being done to alleviate or eradicate it.**—The cases which come to the hospital are being treated. Beyond this nothing is being done by public or private agencies.

PARAGUAY.

1. **Prevalence of hookworm infection.**—The following letter addressed to Cornelius Ferris, American Consul at Asuncion, gives our only available information on the subject:

"In fulfillment of my promise this afternoon, I beg to confirm the information which I gave you, that hookworm disease is very prevalent in this country. Since 1865, when the tyrant, Solano Lopez, commenced the war which lasted until March, 1870, the whole population had been living in a state of semi-starvation. The survivors of that great calamity continued to die off, as during the latter years of the war, from diarrhea, attributed ignorantly by us to the mere want of a healthy food, without suspecting the existence of a parasite in the bowels, until 1880, when it was shown in an epidemic among the workmen in the St. Gothard tunnel to be caused by the hookworm or *Ancylostoma.* * * * With regard to parasitic worms and disease-bearing protozoa our field is still unexplored, but if American investigators, who rank in the first line today, could be induced to come with the text of St. Luke 10: 1 to 16, they would return again with joy like those 70 gospel messengers.

"Yours sincerely, WM. STEWART, M. D."

2. **Preventive measures.**—Mr. Ferris reports: "Nothing is being done to alleviate or eradicate the disease."

PERU.

1. **Distribution of the infection.**—Dr. J. C. Gutierrez, Acting Assistant Surgeon, U. S. Public Health and Marine Hospital Service at Calao, Peru, reports: "Peru is infected with hookworm disease. The territory of Peru is divided into three zones—the Coast, the Sierra or Cordillera, and the Montana or forest region. The latter is the sole region recognized as infected. This zone extends from the slopes of the Cordilleras as far as the frontier of Brazil and Bolivia, and represents close upon two-thirds of the total surface of Peru; the population may be set down as 450,000 inhabitants. At Iquitos there are many cases of hookworm disease. * * * The infection is known only among the agricultural classes. Among the workers in the mines are seen some cases, * * * but all of them have visited the Montana region, so that it is not possible to ascertain if the patients became infected while working in the mines."

2. **Degree of infection.**—Dr. Gutierrez reports: "Thirty per cent of the poor in the Montana region are infected with hookworm disease. Among the people of the better class cases are rare."

3. **Relief measures.**—The same report continues: "Nothing is being done by public or private means to alleviate or eradicate the disease."

PORTO RICO.

1. **Distribution of infection.**—When the Porto Rico Anemia Commission, established as a result of Ashford's earlier investigations, took up its work in 1904 it was found that hookworm infection was present over the whole island; infection was heaviest on the coffee plantations in the mountain regions. The parasite found in Porto Rico is *Necator americanus.*

2. **Degree of infection.**—The population of the island was in 1904 about 1,000,000; it was estimated that about 800,000 of these were infected; that among the workers on coffee plantations infection would run as high as 90 per cent.

3. **Conditions favoring spread of infection.**—The climate is tropical; the rainfall abundant; with the exception of a brief season, the ground under the coffee trees is rarely ever dry; the jibaro pollutes the soil around his hut; this soil is covered with a mulch of decaying leaves and is shaded by banana plants and coffee trees; the jibaro goes barefooted the year round and throughout life; the children under 6 years old usually go unclothed.

4. **Relief measures.**—The Porto Rico Anemia Commission began systematic work in 1904; since that time more than 300,000 Porto Ricans have been treated. Treatment is given free at anæmia dispensaries, which are maintained at convenient points over the island; instruction in sanitary measures is given to the people as they are treated and is given to the children in the schools. The Porto Rican government is this year (1911) expending $50,000 for the maintenance of the work.

NOTE.—The laborate reports of the Porto Rico Anemia Commission make it unnecessary to give here a detailed account of the work.

SALVADOR.

1. **Distribution of infection.**—The first case of hookworm disease reported in Salvador was discovered by Dr. H. Prowe in 1887. In 1889 Dr. Prowe reports that he has seen hundreds of cases in Salvador; that it is heaviest among the coast Cordilleras and in the central portion; that the east and west sections of the country are for the most part free.* Harold D. Clum, Vice Consul General at San Salvador, reports: "The Hospital Rosales, in San Salvador, is the only place in this Republic where the disease has been observed and from which it has been possible to obtain any data regarding the degree or spread of the infection. * * * From 1903 to the present year (1911), 1,482 examinations have been made in the Laboratory of Biological Chemistry in this institution. * * * Among the patients found to be suffering from hookworm disease there were persons from all of the fourteen departments and practically all of the principal towns and cities, as well as many of the smaller villages of the Republic, from which it is evident that the infection extends over the entire country." He reports infection as heaviest among agricultural day laborers; as present also among miners, masons, and bricklayers.

2. **Degree of infection.**—Our present knowledge is not sufficient to justify a statement of the degree of infection in percentages. Dr. Prowe examined at Hospital Rosales 112

*Arch. f. path. Anat. [etc.], Berl., 1899, v. 7 (3), pp. 458–474.

persons, 65 of whom he found infected. Of 1,482 examinations made at the laboratory of this institution from 1903 to 1911 infection was found in more than 30 per cent of the cases.

3. **Relief measures.**—Mr. Clum reports that no measures have been adopted by public or private agencies to alleviate or eradicate the disease; that it has not been regarded as meriting special attention; that comparatively few physicians of the country are acquainted with it.*

SURINAM, OR DUTCH GUIANA.

1. **Distribution of infection.**—Dr. E. A. Koch, medical inspector for the colony at Paramaribo reports that hookworm infection is spread over the whole of the colony; that it is especially prevalent wherever immigrants are collected in large settlements. The labor on the plantations is composed mainly of immigrants from India and Java. This immigration has brought a steady stream of infection into the country.

2. **Degree of infection.**—An estimate of the degree of infection for every infected area has not been made, but many plantations have been found on which the infection runs as high as 90 per cent.

3. **Relief measures.**—For the eradication of the disease the following measures have been adopted:

a. Sanitary privies have been provided for British Indian and Netherland Indian immigrants.

* Mr. Clum derives his information from Dr. Pedro A. Villacorta, in charge of the Section of Demographic Statistics of the Superior Board of Health of Salvador, and from Dr. José C. Gasteazoro, a practising physician of the city.

b. A law has been enacted against soil pollution along the roads and on the plantations.

c. The distribution of popular literature in the Hindostanese and Javanese tongues.

d. Treatment in plantation hospitals of all those who are infected, together with periodical examinations of those who are suspected of being infected. The treatment given is as follows: A purgative in the evening; on the following morning four to six grains of thymol in pills, followed a few hours later by another purgative.

TRINIDAD.

1. **Distribution of the infection.**—Franklin D. Hale, American Consul at Trinidad, reports: "All over the island. The infection is agricultural."

2. **Degree of infection.**—Of 25,055 cases of sickness, treated at estate hospitals during the year 1909, 994 were classified under the head of hookworm disease, as against 121 cases for the year 1907.

3. **What is being done to eradicate the disease.**—Nothing is being done by the government; no decisive action has been taken by any private agency. Cases are being treated in estate hospitals. The Agricultural Society at its meeting, June, 1910, appointed Dr. Nasson a committee of one to investigate and report on the disease.

VENEZUELA.

1. **Distribution of infection.**—Physicians at Maracaibo report infection in the region south of Lake Maracaibo; Herbert R. Wright, at Puerto Cabello, reports that consular

district as infected; Isaac A. Manning, American Consul at La Guayra, advises that no study has been made of the geographical distribution of hookworm disease in Venezuela; that a leading physician in Caracas reports having knowledge of the general presence of infection throughout the country. Dr. Louis Razetti, of Caracas, advises that at the meeting of the National Congress of Medicine next June there will be a report from each state as to general distribution of hookworm infection.

2. **Degree of infection.**—No accurate data for an approximate estimate. At San Esteban, a village about ten kilometers from Puerto Cabello, the infection is reported as extending to "a great part of its inhabitants."

3. **What is being done to eradicate the disease.**—Some physicians are treating cases in their private practice. It is expected that the report from the states at the meeting of the National Congress of Medicine next June will be the beginning of some concerted action for the eradication of the disease. Beyond this nothing is being done.

III. ASIA.

BAGDAD, TURKISH PROVINCE OF.

1. **Prevalence of infection.**—Mr. Leonard, American Vice and Deputy Consul at Bagdad, reports: "The Turkish Province of Bagdad is infected with hookworm, but the geographical distribution of the infection within the country is unknown. * * * The infection is agricultural."

2. **Degree of infection.**—The report estimates the degree of infection at about 10 per cent.

3. **Preventive measures.**—Nothing is being done by private or public agencies to alleviate or eradicate the disease.

CEYLON.

1. **Infection.**—Both *Ancylostoma duodenale* and *Necator americanus* are found in Ceylon. The infection covers practically the whole of the planting districts where Tamil labor is used; it involves also the Sinhalese villages on the confines of the planting districts. The disease is more prevalent on the estates situated in the "low country."

2. **Degree of infection.**—Badly infected estates may have the labor force infected to the amount of 90 per cent. The committee appointed by the Colonial Secretary to consider measures to prevent the spread of hookworm disease in the island recommends that all superintendents of estates treat all new arrivals with beta-naphthol. "The ground for this recommendation," says the report, "is that the percentage of coolies arriving in the island who are suffering from this

disease in a more or less marked degree is so high that the disease may be said to be practically universal." The committee also recommends the treatment of the whole labor force on infected estates.

3. **Infection agricultural.**—The infection is confined practically to those who follow agricultural pursuits. The number of persons working in mines is very small; the presence of infection among them has not been ascertained; evidence of the symptoms of the disease among them is absent.

4. **Origin and spread of the infection.**—It is not known whether the native population of the island was originally infected; it seems to have been at least relatively free from it. Most of it certainly has been brought into the island by the importation of coolie laborers from South India. On March 17, 1910, the Colonial Secretary writes to the chairman of the Planters' Association: "I am directed by the Governor to inform you that it has lately come to the notice of the government that not only is ancylostomiasis [hookworm disease] on the increase in Ceylon, but that in districts where Sinhalese labor is employed upon estates the disease is showing a tendency to spread to the native population of the island, who hitherto have for the most part been free from it. Recent investigations, as you are aware, have also disclosed the fact that a considerable percentage of the immigrant coolies landing in Ceylon for employment upon the estates are already on arrival infected by the disease."

5. **Conditions which favor the spread of the disease.**—The climate of Ceylon is warm and moist; the coolies on

the estates are massed in "lines;" the lines are not provided with latrines, and the planters contend that the coolies cannot be made to use the latrines even when they are provided; the habits of the coolies are to befoul the soil about the lines and on the estates where they work; their feet and legs are not protected from contact with the polluted soil.

6. **What is being done to alleviate or eradicate the disease.**—On February 4, 1909, the English Government sent to the Governor of Ceylon the following dispatch:

The Right Hon. the Earl of Crewe, K. G., to Governor Sir H. E. McCallum, G. C. M. M., A. D. C. Ceylon. No. 53.

DOWNING STREET, *February* 4, 1909.

SIR: I have the honor to inform you that a committee has been sitting at this office to consider what measures could be recommended for the prevention of ancylostomiasis in the colonies affected by that disease.

2. This committee has been presided over by Sir Patrick Manson, and has numbered amongst its members Professor J. S. Haldane, F. R. S., who some years ago was commissioned to report to the Home Secretary on the prevalence of ancylostomiasis in the Cornish mines.

3. Reports on the existence and treatment of ancylostomiasis have been obtained from a large number of colonies and have been laid before the committee, who have also taken verbal evidence from a number of medical officers and others who have had experience of the disease.

4. I have now been furnished with a copy of the report of the committee, and in this dispatch I propose to summarize the conclusions at which I have arrived after perusing it.

5. Having considered the reports from the several colonies, with the observations of the committee upon them, I recognize that the loss of labor caused by the prevalence of ancylostomiasis is very serious, and affects prejudicially not only the employers of labor, but the community at large. Not only is there serious loss of life, direct and indirect, but also through the invaliding of laborers the charges for hospitals and pauper expenditure are largely increased. This loss is, in my opinion, largely avoidable. Experience has shown that certain simple, well-understood, and inexpensive measures can be adopted, which, if properly carried out, will reduce the evil effects of anchylostomiasis to a negligible quantity.

6. I think that the colonial authorities have been inclined to exaggerate the difficulties of dealing with this question. They have argued that the complete eradication of ancylostomiasis is impracticable, and that the cost of preventive measures is prohibitive; and they have been content, with a few commendable exceptions, to do nothing in the matter.

7. It cannot be too clearly understood, however, that, provided that reasonable precautions are taken to prevent the constant reinfection of the laborers, the presence of a small number of anchylostohis, even in a large proportion of the population, may have no appreciable effect. Moreover, no elaborate sanitary appliances are necessary to guard against reinfection on a large scale. For example, latrine accommodation on estates is, I am advised, sufficiently subserved by a hole or trench cut in the ground, provided that the contents are covered with earth from time to time. If it is insured that this accommodation will be used by a

majority of the laborers, the fact that isolated cases of fouling of the soil cannot be prevented is not of material importance. The main point is to guard against the fouling of the soil in places where, from the condition of the soil and the presence of numbers of laborers, it is clear that danger is to be apprehended.

8. In these circumstances I think that no hardship can be involved in compelling estate owners, local bodies, and private persons to take such reasonable precautions as experience has shown will minimize the constant drain on the resources of the community which the existing state of affairs involves.

9. I therefore recommend, for your very careful consideration, that—

a. Wherever necessary, laws should be enacted enforcing the provision on estates and elsewhere that numbers of laborers are collected of simple, inexpensive, but efficient, latrines, in places appropriate both as regards the convenience of the laborers and the health of the public.

b. A penalty should be imposed on persons found avoidably defecating in any place where contamination of the soil or water would be likely to cause risk of infection.

c. Each colony should be divided into convenient districts, in each of which should be appointed an inspector responsible to the local authority, medical officer, or some other authority, who should be charged with the enforcement of sanitary regulations.

d. In all schools object lessons on ancylostomiasis should, as far as possible, be given. Leaflets containing simple information on the subject should be distributed periodically. The committee consider that the pamphlet

prepared by Dr. Nicholls, of the Leeward Islands, would form a suitable model.

e. While the treatment for anchylostomiasis of the whole population is clearly impracticable, arrangements should be made for the distribution from convenient centers, such as schools, post-offices, district nurse stations, etc., of anthelmintics at cost price, with simple directions for use. For this purpose beta-naphthol is the most suitable drug, thymol and other toxic anthelmintics being used only under medical supervision.

10. It has further been suggested that an inspector-general should be appointed, his salary being divided amongst the several colonies concerned, whose duty it would be to supervise the measures taken for the eradication of ancylostomiasis and to distribute advice and information. The appointment would, it is suggested, be purely temporary in the first instance. While I shall be glad if you will place this suggestion before the Legislature, if a convenient opportunity should occur, and invite their observations upon it, I wish it to be clearly understood that discussion of this proposal should not be allowed to interfere with the carrying out of the measures which I have advocated above. The appointment of such an officer would, I recognize, involve financial and constitutional questions of some complexity; and I do not wish that the execution of the more immediately prcaticable measures for the eradication of anchylostomiasis should be deferred pending the discussion of these questions.

11. I enclose a short memorandum in which the reports received from the several colonies concerned were summarized for the purpose of the committee. Should you desire to obtain further information in regard to any of

the measures referred to in this memorandum I shall be glad to supply you with a copy of any particular report.

12. I request that you will inform me in due course what additional measures for the prevention of anchylostomiasis you propose to take in pursuance of the recommendations made in this dispatch, and that you will include annually in the medical report some account of the progress of those measures.

13. A dispatch in identical terms is being addressed to the Governors of the West Indian Colonies, with the exception of those in which the disease is reported to be unknown.

I have, etc.

CREWE.

On May 26, 1910, the Governor of Ceylon appointed a committee to report on measures for the prevention of the spread of the disease. On the 24th of August, 1910, this committee submitted the following report:

SIR: In reply to your letter of May 26 last, appointing us a committee to consider and advise as to the measures to be taken to prevent the spread of ancylostomiasis in the Island, we have the honor to submit the following report.

2. The committee met in Kandy and in Colombo, and examined witnesses both medical and planting. We also received replies to a series of questions which we addressed to gentlemen who were likely to be able to give useful information to the committee on the subject. The evidence and the written answers to the questions which were asked are attached as appendices to this report.

3. The conclusions at which we have arrived on the evidence that has been brought before us are summarized in the following recommendations:

(1) That all superintendents of estates should treat new arrivals with beta-napthol, followed by tonics; particulars of the course of treatment recommended by the Principal Civil Medical Officer according to the age of the laborer are annexed. The ground for this recommendation is that the percentage of coolies arriving in the Island who are suffering from this disease in a more or less marked degree is so high that the disease may be said to be practically universal. In the rare cases where it does not occur the treatment will not be injurious.

(2) Where it is known that ancylostomiasis already prevails on estates, superintendents should treat the whole labor force in convenient batches in a similar manner. We have ascertained that coolies do not object to the treatment, which can be carried out without greatly interfering with the labor force.

(3) When any case of anchylostomiasis occurs amongst laborers admitted to hospital, the medical officer should notify the employer. This is for the purpose of informing the superintendents who may previously have been in ignorance of the existence of the disease on their estates, in order to enable them to take action forthwith.

(4) The drugs required for the treatment should be issued at cost price from the Civil Medical Stores. Where estates have dispensaries and are therefore allowed a small sum per cooly for medicines, we recommend that the drugs required for the beta-napthol treatment may be used for Singhalese as well as Tamil laborers up to the limit of the present capitation grant for free drugs for Tamil coolies. Under existing conditions employers have to certify that medicines have been used for their Tamil coolies only, and any drugs required for Singhalese laborers have to be paid for, even though the limit allowed for free medicines has

not been reached. It is highly desirable that facilities for treating Singhalese should be granted, as otherwise they may be the means of introducing the disease into their villages, where it has hitherto been almost unknown.

(5) Medical officers in charge of districts should report to the Principal Civil Medical Officer, through their immediate superiors, the prevalence of anchylostomiasis in a severe form on any estate. In such cases the Principal Civil Medical Officer should be empowered to send an officer of his Department to inspect, report, and make recommendations for combating the disease. If the Principal Civil Medical Officer approves these recommendations, they should be communicated to the superintendent with a view to their adoption. Where these recommendations have not been carried out at the end of three months, Government shall be empowered to enforce the Principal Civil Medical Officer's recommendations at the expense of the estate.

(6) With regard to the question of the improvement of sanitation on estates, we recommend that every set of lines and its immediate surroundings should be cleaned and swept once every day. All sweepings should be burnt or buried. The evidence tended to show that more line sweepers should be employed. At least 12 feet clear of all vegetation must be maintained round the lines. Stone, brick rendered in cement, or cement concrete drains should be constructed to carry off rain from the roofs and from the immediate vicinity of the lines. The immediate vicinity of the lines should be on a lower level than the floor of the lines and slope downwards from them, with the object of keeping the ground surrounding the lines as dry as possible, as the hookworm flourishes in damp earth. All excreta deposited within 50 feet of the lines should be removed daily and buried by the sweeper.

(7) At all bathing places, whether at spouts, wells, or riverside, there should be stone or paved platforms with a properly constructed run-off drain where necessary. This is with the object of preventing the reinfection of coolies through the feet when standing on damp earth. Wells for bathing and wells for drinking water should be kept separate.

(8) To prevent the contamination of the water supply for drinking purposes, closed iron piping is strongly recommended. Open coffee spouting should be condemned. Wells should be lined with brick pointed with cement and have parapet walls, and a surrounding platform 4 feet wide of stone paving, cement concrete, or brick cement rendered, and a surrounding drain to conduct the waste water away. Wells for domestic and drinking purposes should be covered and provided with a pump.

(9) Whilst recognizing the great importance of latrines on estates, we are forced to the conclusion from the evidence given that it is not at present advisable to recommend their general compulsory adoption, but we would urge on all employers of labor the desirability of establishing them especially for bungalow coolies, factory coolies, school children, and Public Works Department lines.

(10) The attention of agents, visiting agents, and managers of estates should be invited to the recommendations of the committee, and they should be especially requested to do all in their power to give effect to them.

(11) The question of the segregation of newly-arrived coolies has had our careful consideration, but we do not consider that it would be practicable. Great delay would be involved thereby, and the recommendation of the general treatment of all new coolies should, in our opinion, fully suffice.

4. The committee are confident that the adoption of the measures which have been recommended above will prevent the spread of the disease without disorganizing the labor force of the Island, and without involving much unnecessary cost to the employers of labor.

We have, etc.

H. L. CRAWFORD.
W. H. JACKSON.
ALLAN PERRY, M. D.
JOSEPH C. DUNBAR.
F. H. LAYARD.
HERBERT K. HILLYER, *Sec'y.*

AUGUST 24, 1910.

Under date of June 7, 1911, Dr. Perry of this committee advise that: leaflets have been sent to employers of immigrant labor; special superintending medical officers are to be engaged to report on the sanitary condition of estates with particular reference to hookworm infection and disease. A legislative enactment has been drafted to be presented to the Legislative Council at an early date.

CHINA.

I. Prevalence of the infection.—1. **Swatow District.** The Swatow District comprises the northeastern portion of Kuangtung Province. Population seven or eight millions. Occupation agricultural.

(1) **Distribution of infection.**—Infection throughout the district; most severe among the farmers.

(2) **Degree of infection.**—Dr. G. Duncan Whyte of the English Presbyterian Mission places the infection for the

whole population at 54 per cent; for the farming population at 74.5 per cent. Estimate made on basis of microscopic examination made at hospital.

2. **Ngan-hoe Province.**—(1) **Distribution of infection.** Wilbur T. Gracey, American Consul at Nanking, reports: "This infection is generally distributed throughout the rice farming and gardening areas of the Yangtze River valley, to the definite knowledge of American physicians resident here."

(2) **Degree of infection.**—Mr. Gracey states that of 500 persons recently examined 24.6 per cent were infected; of this 500 only about one-half were farmers. For a group of 51 farmers recently examined the percentage of infection is 72.8; for another group of 40 farmers the infection is 76 per cent.

3. **Chekiang and Kiangsu Provinces.**—This report covers the whole of Chekiang Province and that part of Kiangsu Province south of the Yangtze River and east of 119 degrees east longitude.

(1) **Distribution of the infection.**—Amos P. Wilder, American Consul at Shanghai, writes: "I have obtained the opinions of foreign doctors in many parts of this district and in every case the reply is definitely made that infection exists throughout the district."

(2) **Degree of infection.**—There has not been enough investigation to give a basis for an approximate estimate of the degree of infection; some of the doctors on basis of general observation place it at from 5 per cent in the cities to 25 per cent among farmers. One doctor who has made many examinations of fæces reports about one out of every ten infected.

4. **Sze-Chuen Province.**—(1) **Distribution of infection.** Albert W. Pontius, American Consul at Choong-king, reports: "The existence of hookworm infection is universal throughout the Province, and is fairly evenly distributed."

(2) **Degree of infection.**—Consul Pontius reports: "Out of 1,000 examinations in the M. E. Mission Hospital for Men, 445 had hookworm infection, while only 2 were infected among 25 women examined in the mission's women's hospital. The infection is nearly 100 per cent among the agricultural workers."

5. **Hoo-Pe Province.**—(1) **Distribution of infection.**—R. B. Mosher, American Consul at Hangkow, reports: "The parasite has been found by nearly all investigators who have systematically looked for it in many mission hospitals throughout Central China. Chiefly *Ancylostoma,* but *Necator* has also been identified."

(2) **Degree of infection.**—Statistics not sufficient for more definite statement than that the infection is heavy.

6. **China as a whole.**—In 1907 the Medical Missionary Association of China organized a department for systematic research to be conducted for three years; during this period reports were sent in from practically all provinces; the results are summarized in "Diseases of China", by Jefferys and Maxwell, 1910. Of hookworm disease the authors say:

1. That we owe our knowledge of the disease in China to the Medical Missionary Association.

2. That it is one of the most serious factors of disease in the Empire.

3. That the infection is extremely wide-spread throughout the Southern two-thirds of China.

4. That, "excluding the four most northern provinces of Kansoo, Shense, Shanse, and Chili, from which reports are wanting or incomplete, we can confidently affirm that the other 14 provinces are widely infected, the rule being that the further South one travels the more severe the infection. It is also reported as fairly common from Korea, and is extremely frequent in Formosa, 44 per cent, in a series of 1,000 male patients."

II. Conditions which favor the spread of the disease in China.—All reports show the infection to be most severe among agricultural workers. Dr. Beebe, an eminent medical authority of the Nanking district, attributes this condition to the fact that the Chinese farmers use human fæces for fertilizer; irrigate growing vegetables with pond water and fæces; and work in the wet soil with bare feet and legs, thus giving opportunity for the larvæ to enter through both the skin and the mouth.

III. What is being done to alleviate or eradicate the disease.—From all these infected provinces the reports come with one voice:

1. That all mission hospitals are examining and treating all cases that come under their care.

2. That nothing is being done by the Chinese Government or the Chinese to alleviate or eradicate the disease.

The reports call attention to certain difficulties in the way of giving aid on a large scale:

1. "Private agencies would have but a poor opportunity of doing any effective work without the support of the authorities."

2. "No systematic attempts are being made to eradicate the disease; and owing to the universal employment of

liquid manure from night-soil by the agricultural and gardening population, it would appear to be a difficult problem."

COCHIN CHINA.

1. **Distribution of infection.**—Dr. F. Noc, military physician, Pasteur Institute of Saigon, conducted a series of investigations covering two years from 1906 to 1908, with a view to discovering the connection, if any, between the very prevalent disease of beriberi and hookworm infection. He reports* that of 77 cases of beriberi examined in 1906, 74 carried hookworm infection; that of 211 cases of beriberi, all have had hookworm infection; that in these investigations he demonstrated hookworm infection in 2,326 cases; that his investigations have demonstrated that there is an intimate relation between beriberi and hookworm disease, and that hookworm infection is extremely prevalent among the Asiatics of Cochin China. Both *Ancylostoma duodenale* and *Necator americanus* are present; *Necator* is the prevailing type.

2. **Degree of infection.**—It is not possible on the basis of data at present available to state the degree of infection in terms of percentages. The records of Dr. Noc would seem to show, and his report repeats with emphasis, that infection is *extremely prevalent* among the Asiatics of Cochin China.

3. **Causes favoring the spread of infection.**—In addition to the tropical temperature and a high degree of humidity, Dr. Noc states that the natives go barefooted and are extremely careless as to soil pollution.

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* Ann. de l'Inst. Pasteur, Paris, 1908, v. 22 (11), 896–916, 956.

4. **Relief measures.**—No report on this subject.

INDIA.

1. **Distribution of infection.**—The entire area of India seems to be infected with hookworm. It is most prevalent in Bengal, Eastern Bengal and Assam. Infection is heavy among the Tamils of Southern India. Both the old and the new world species are present.

2. **Degree of infection.**—It is estimated that from 60 to 80 per cent of the inhabitants of India harbor the worm to a greater or less extent (C. P. Lukis, Surgeon General I. M. S.).

In 1903, Surgeon Major Edwin Dobson, at Dhubri, Assam, selected for examination 547 of the more healthy looking immigrant coolies from all parts of India. Of the 547 examined 454 were infected. His record of hundreds of examinations of prisoners, immigrants, patients in hospitals, laborers in various occupations shows the infection to range from 60 to 80 per cent and to be spread over all parts of India. (Indian Medical Gazette, 1892, 1893, 1900, 1904, 1906.)

The Government Medical Inspector for British Guiana reports that of the Indian immigrants to that country for the year 1909, 74.44 per cent were infected. A shipload of Indian coolies just arrived at Durban, Natal, in 1908, showed on examination an infection of 93 per cent. Dr. C. A. Bently reports finding in Assam only one cooly out of 600 who did not show infection. Dr. Dobson found 75 per cent infection among the newly arrived coolies at Dhubri.

3. **India a center of infection.**—From the Indian Peninsula a constant stream of infection is going into Assam, Ceylon, Southeast Africa, British Guiana, Dutch Guiana, Jamaica, and all countries that are importing cooly labor.

4. **Conditions which have favored its spread in India.**—High temperature, extreme moisture, shade; a dense population, the habit of polluting the soil universal and persistent, feet and limbs unprotected the year round.

5. **What is being done to alleviate or eradicate the disease.**—A considerable amount of work has been done by medical officers in India; the results of their investigations have been published in the Indian Medical Gazette and the British Medical Journal. In 1890 the Government had made a special report on Kala Azar and Beriberi in Assam and in 1897 a report on epidemic malarial fever in Assam, both of which involved the subject of hookworm disease. Under date of June 15, 1911, Surgeon General C. P. Lukis writes: "From these papers it will appear that from 60 to 80 per cent of the inhabitants of this country harbor the worm to a greater or less extent. * * * I have at present no information available as to the work being done by public or private agencies to eradicate the disease beyond the extension of sanitary measures for the prevention of fæcal contamination of the soil, the protection of the feet and the treatment with thymol, the eucalyptus oil mixture, or beta-naphthol, of such patients who may attend hospital." The American Vice Consul, C. B. Perry, writing under the same date, says: "Nothing is being done by Governmental agencies to alleviate or eradicate the disease except the usual sanitary measures for the prevention of fæcal contamination of the soil and hospital treatment of incapacitated

patients. * * * The conclusion that I have arrived at is that although widely prevalent in India, the disease is not considered of a dangerous nature and no special steps have been deemed necessary as yet to combat it."

JAPAN.

1. **Distribution of the infection.**—Surgeon Fairfax Irwin, of the U. S. Public Health and Marine-Hospital Service at Yokohama, reports that the infection is present to a greater or less extent in every prefecture of Japan; that the infection is present both in mines and on the surface; that it is most frequent among farmers. Special local reports definitely locate infection in the following prefectures:

1. Kyoto Fu.—The disease found in almost every part of the prefecture.
2. Shiga Ken.—Only a few isolated cases in remote parts of the prefecture.
3. Naru Ken.—Number of cases not very many, but disease is spreading.
4. Kochi Ken.—770 cases reported for 1910.
5. Gifu Ken.—Infection in some parts of prefecture among agricultural workers.
6. Toyama.—Disease held in check by preventive measures.
7. Nagano Ken.—In 1909, there were 1,843 deaths from the disease; for 1910 the deaths number 1,893.
8. Ishikawa.—Badly infected; deaths in 1910 due to this cause 1,325.
9. Shidzuoka.—From 1907 to 1909, reported 8,419 sufferers from this disease.
10. Akita.—Infection not heavy.
11. Aomori.—Disease exists; under investigation.
12. Ibaraki.—Few cases observed.

13. Niigata.—Infection light.

14. Tochigi.—Infection light.

15. Osaka-fu.—Isolated cases.

16. Hyogo Ken.—Cases among farmers and some in mines.

17. Wakayama Ken.—1,130 cases reported for 1910.

18. Hiroshima Ken.—Cases observed in all the counties.

19. Tottosi Ken.—Disease found in every part of the prefecture.

20. Shimane Ken.—Isolated cases in every part of the prefecture.

21. Okayama Ken.—Disease found in every part of the prefecture.

22. Yamaguchi Ken.—Disease present in every part of prefecture; cases reported for 1909, 482.

23. Kanagawa.—Disease believed to be limited to miners and agriculturists.

The following tabular statement from report for the prefecture of Yamaguchi is instructive:

Number of Cases of Hookworm by Occupation.

Occupation.	1907.		1908.		1909.	
	Male.	Female.	Male.	Female.	Male.	Female.
Government or public service	11	...	22	2	23	...
Scientific	35	8	47	24	37	32
Medical	...	...	1	...	...	...
Agricultural	140	81	201	103	155	95
Commercial	40	33	47	34	45	20
Manufactural	5	1	9	0	4	2
Fishing	...	...	...	...	...	1
Shipping	2	1	...	...	2	...
Mining	...	...	1	...	...	...
Laborers	6	...	5	...	4	...
All others	19	32	21	48	15	48
	258	156	354	211	285	198

2. **Degree of infection.**—Lack of systematic investigation makes it impossible to approximate the degree of infection. From the prefecture of Tosa 770 cases are reported for 1910; Nara-ken reports an estimated infection of about 5 per cent of the population. The fact that infection is present in every prefecture would indicate a heavy infection in localities where conditions are most favorable. Rice growing in the absence of strict sanitary regulations would seem to supply conditions for a heavy infection. The following exhibit is a rough index to the prevalence of the disease:

Number of Cases of Hookworm by Cities and Counties.

City or county.	1907.			1908.			1909.		
	Male.	Fem.	Total.	Male.	Fem.	Total.	Male.	Fem.	Total.
Oshima	2	...	2	2	1	3	2	...	2
Kuga	4	3	7	6	3	9	12	9	21
Kumage ...	1	1	2	2	...	2	2	2	4
Tauno	7	3	10	8	4	12	10	6	16
Saba	11	6	17	16	8	24	14	10	24
Yoshiki	103	65	168	143	93	236	104	78	182
Asa	40	24	64	56	36	92	34	51	85
Toyo-ura ..	9	6	15	13	6	19	9	7	16
Mine	29	13	42	39	25	64	32	20	52
Shimonoseki	12	8	20	9	4	13	9	2	11
	218	129	347	294	179	474	228	185	415

3. **Relief measures.**—Dr. Irwin reports: "For the eradication of the disease some effort is being made. In Hyogo an attempt is being made to improve the general sanitary conditions by the construction of water closets and drains and improving the water supply. In some places lectures on the subject are being given." Some of the local reports state that persons found infected are being treated with

thymol. No comprehensive, systematic effort is being made.

JAVA.

1. **Distribution of infection.**—Dr. J. J. Kunst, army physician at Ambarawa, Java, estimates that infection is very widespread throughout Java and the Archipelago.* Dr. A. J. Salm reports a series of investigations which demonstrate infection throughout Java and the Archipelago.† Javese immigrants on plantations in Dutch Guiana are found heavily infected.‡

2. **Degree of infection.**—The following investigations may serve as an index to the distribution and degree of infection:

(1) Dr. J. J. Kunst:

a. At Ambarawa, middle Java, demonstrated infection in a nine-year-old boy, European, who had lived in the country only eight months.

b. Examined, 140 natives from villages throughout Ambarawa district; infected, 20 per cent.

(2) Dr. A. J. Salm reports:†

a. Dr. Erni in 1896 found that 67 per cent of the native employees on a tobacco plantation at Deli were infected; of these 10 per cent to 15 per cent were severely anemic.

b. Dr. Van Steeden at Sawah Loento in 1901 examined the convicts in the government mines to which are sent convicts from the whole Archipelago who are condemned to forced labor from five to twenty years. Of 52 examined

* Janus. Haarlem, 1910, v. 15, pp. 221 fol.
† Gaz. hebd. d. sc. méd. de Bordeaux, 1904, v. 25, p. 164.
‡ Dr. E. A. Koch, correspondence.

51 were infected. He concluded that the whole Archipelago was heavily infected.

c. Dr. Steiner at Soerabaia examined the prisoners who passed through that place on their return home. Examined, 11; found infected, 11. He found infected 24 convicts who had not worked in the mines.

d. Dr. Van der Meer, physician who succeeded Dr. Van Steeden at Sawah Loento: Examined, 273 convicts who had arrived there as miners; found infected, 254.

e. Dr. Benjamins at Samarang: Examined, all patients in his hospital, 100 in number; found infected, 70. Many of these were natives who had not worked in the mines.

f. Dr. Klaasen found infected 50 natives of Java who had just arrived from Borneo. Of these 2 were extreme cases; one had 20 per cent hemoglobin; the other 12 per cent hemoglobin.

3. **Relief measures.**—Dr. Van der Meer recommends the following measures for the mine operators:

1. Supply the mines with latrines.

2. Do not eat during working hours.

3. Provide lavatories above ground and have all workers on leaving the mines clean themselves.

4. In newly opened mines work only persons who are not infected.

For the general population Dr. Salm recommends that all people drink only pure water; that they avoid especially water of open streams. He is convinced that drinking impure water is the main source of infection; this on the ground that the natives by established custom defecate in running water.

KOREA.

1. **Distribution of infection.**—Dr. O. R. Anison, in charge of the Severance Hospital at Seoul, reports that the country is infected; that the full extent of the geographical distribution is not yet known; that his own judgment is that it is distributed throughout the whole country. Dr. Weir, of Chemulpo, reports finding infection in patients from all parts of the country.

2. **Degree of infection.**—Dr. Weir, who has examined the fæces of a large number of people sick and well with a view to discovering hookworm infection, says that 50 per cent of all cases examined were found infected with hookworm. Of all those infected, about 70 per cent were farmers.

3. **Preventive measures.**—The American Consul-General at Seoul, through whose efforts the above facts were secured, reports that no public measures have been adopted for the relief or prevention of the disease; that nothing has been done by private agencies save the treatment of cases that come to the doctors. The subject has been taken up by the Korean Medical Missionary Association.

MALAY STATES.

1. **Distribution of infection.**—Infection is prevalent over entire area of Federated Malay States. It seems heaviest among the Tamil laborers on rubber estates; found also among Javanese and Chinese laborers. The Tamils from India constitute three-fourths of the laborers on estates. Both *Necator americanus* and *Ancylostoma duodenale* are found.

2. **Degree of infection.**—Dr. W. L. Braddon, State

Surgeon at Seremban, reports: "I am able to affirm that it is *to one single disease* that almost all the mortality and sickness of the Tamil laborer is either directly or indirectly due. That disease is ancylostomiasis."* During 1908 he examined 2,000 sick Tamils in estate hospitals and reports: "There was no single one of these coolies who was not affected by ancylostomiasis." At several estates he found "that 60 per cent of the coolies *at work* were in an advanced state of hookworm disease, and that in all cases examined anemia from the same cause was in some degree present." These facts were presented to the Government as indicating the severity of the disease throughout Negri Sembilan. "There is no reason to suppose," continues the report, "that it is any less prevalent in the other states of the Federation."

Dr. A. T. Stanton, bacteriologist, Institute for Medical Research, reports the following findings:†

a. Estate Hospital in Negri Sembilan.—Examined, 152; percentage infected, 56.

b. Rubber estate in Selangor, No. 1.—The place enjoys the reputation of being a "very healthy estate." Number examined, 158; all at work; percentage infected, 25.

c. Rubber estate in Selangor, No. 2.—Considered unhealthy chiefly on account of malaria. Number examined, 64; percentage infected, 53.7.

d. Rubber estate in Selangor, No. 3.—Recently opened up. Number examined, 114; all at work on day of examination; percentage infected, 31.

Dr. E. Naggiar Graham, medical officer, Lower Perack, reports these findings:‡

* "The Prevalence of Ankylostomiasis in Ceylon," XV, 1910, p. 20.
† Ibid., pp. 21 and 22.
‡ J. Trop. M., Lond., 1909, v. 12 (22), p. 333.

TELUK ANSON HOSPITAL.

	Number examined.	Percentage infected.
May, 1910	74	54
June, 1910	62	61
July, 1910	98	47
August, 1910	82	57
Estate: S. W.	250	68.8
N. S.	26	73

Dr. Graham estimates that more than 50 per cent of the entire population is infected; that the disease is of great economic importance to the rubber industry.

3. **Conditions favoring spread of the disease.**—In addition to favorable climatic conditions, Dr. Graham reports that drains are very numerous on the rubber estates; that the laborers defecate in these drains; that they use these drains for bathing purposes and frequently drink from them.

4. **Relief measures.**—The Government has sent a letter to managers of estates directing attention to the steps to be taken to prevent the spread of infection. Cases are treated in estate hospitals. Measures so far adopted seem altogether inadequate.

PHILIPPINE ISLANDS.

1. **Distribution of infection.**—Systematic survey of the Islands has not been made; infection has been demonstrated at Manila, Taytay, Las Piñas, Cagayan Valley and other points in Luzon; on the islands of Samar and Cebu. Investigations thus far made indicate that infection is general over the Islands. Dr. C. L. Cole reports* that hookworm

*Mil. Surg., Carlisle, Pa., 1907, v. 21, p. 298.

disease is one of the moost prevalent diseases found in the Islands; that examinations indicate a very widespread infection; that infection among the enlisted men in the army causes great loss of time.

2. **Degree of infection.**—Systematic investigation has been made at many different points with the following findings:

a. Manila, Bilibid Prison; Garrison, 1908. Examined, 4,106 adults; infected, 52 per cent.

b. Manila; Garrison and Llamas, 1909. Examined, 227 women; infected, 15 per cent. Examined, 158 children under 15 years; infected, 11 per cent.

c. Taytay, Luzon; Garrison, Leynes, and Llamas, 1910. Examined, 1,000; infected, 11.6 per cent.

d. Las Piñas, Luzon; Bureau of Health, 1909. Examined, 6,000; infected: males, 24.2 per cent; females, 8.06 per cent; average, 16.13 per cent.

e. Baguio (elevation 4,770 ft.); Bowman, 1910. Examined, 100 school children; infected, 32 per cent. By Board for the study of Tropical Disease, U. S. Army, 1910. Examined, adult Igarots; infected, 29 per cent.

f. Cagayan Valley, Luzon; Willets, 1911. Examined, 4,278; infected, 54.37 per cent. Adults examined, 1,350; infected, 74.89 per cent.

g. Gaudara Valley, Island of Samar; Nichols and Garrison, 1909. Examined, about 1,000; systematic records not kept, infection frequent.

h. Danao, Island of Cebu; Brewer, 1910. Examined, 51 children; infected, 18 to 35 per cent. Many cases heavy.

i. Government Hospital for the Insane, District of Columbia; Stiles and Garrison, 1906. Examined, 115 soldiers returned from Philippines; infected, 12.17 per cent.

NOTE 1.—With the exception of the examinations made by Stiles and Garrison, 1906, and possibly of examination by Willets, the above statistics are based upon the examination of only one slide. The use of three slides would materially increase these percentages.

2. Dr. Victor G. Heiser reports* that records of more than 1,000 stools of persons at large show about the same conditions among the general population.

3. **Conditions favoring spread of the infection.**—In provinces no sanitary precautions are taken; privies and vaults are unknown; the ground around each house has been contaminated ever since the house was built. Abundant vegetation around the houses furnishes most favorable conditions of shade and moisture. The barefooted householder and his family are constantly exposed to infection.†

4. **Hookworm disease and the death rate.**—Population of the Philippines at time of American occupation is estimated at about 6,500,000; estimated death rate at over 50 per 1,000. At Bilibid Prison, the death rate under lay management was 238 per 1,000. The prison was placed under the management of the Bureau of Health. The usual sanitary measures reduced the death rate to 70 per 1,000; here it stopped and resisted further efforts. All prisoners over 3,500 were examined for intestinal parasites; infected, 84 per cent; infected with hookworm disease, 52 per cent. After treatment, death rate fell to 13 per 1,000, where it has remained up to the time of the report of 1909, or more than a year.‡

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* J. Am. M. Ass., Chicago, 1909, v. 52 (2), p. 97.

† Dr. C. L. Cole, Mil. Surg., Carlisle, Pa., 1907, v. 21, p. 298.

‡ Victor G. Heiser, J. Am. M. Ass., Chicago, 1909, v. 52 (2), p. 97.

5. **Relief measures.**—Many systematic investigations have been made to determine the prevalence of infection; cases that come to the regular hospitals are treated; general sanitary conditions are being improved. No adequate systematic measures have been adopted to relieve or eradicate the disease. The Bureau of Health is awaiting further investigations to determine conditions before organizing relief measures on a large scale.

SAMOA.

1. **Discovery.**—On November 2, 1909, Passed Assistant Surgeon P. S. Rossiter, U. S. N., discovered hookworm eggs in the stool of a Samoan; two days later he expelled thousands of hookworms which were identified as *Necator americanus*. The discovery was reported to the Governor on December 2, 1909.

2. **Prevalence of the disease.**—There are on the islands of Tutuila and Manua 42 coastal and 11 inland villages with a total population of 6,667. On the basis of investigations conducted by the special board appointed by the Governor and later investigations by Dr. Rossiter it is estimated that of this population about 70 per cent are infected. For the islands of Upalo and Savaii, German Samoa, the investigation indicates a heavier infection than for the islands of Tutuila and Manua.

3. **Conditions in Samoa favoring spread of the infection.**—"The soil is everywhere loose and sandy; the rain is heavy and the ground is always moist; the temperature ranges between 70 and 90 degrees F. throughout the year. The natives are extremely careless of the disposal of fæces,

and in general defecate just beside, if not in, the roads or just outside the houses. A negligible percentage wear shoes, and the native costume, the lava lava, a single strip of cloth about 30 inches wide and 2 yards long, fastened about the waist, permits every part of the body to come in contact with the contaminated soil, for they sit, eat, and sleep on the ground or on mats."

4. **What is being done for its eradication or relief.**—On December 2, 1909, Dr. Rossiter reported to the Governor of Samoa the presence of hookworm infection on the island and recommended measures for its eradication. The Governor appointed a special board to make an investigation and report upon the subject. This board reported making the following recommendations:

(1) The establishment of a board of health whose orders would have the effect of law.

(2) The enactment of a law fixing adequate penalties for disregard of orders or regulations of the board of health.

(3) That orders be issued requiring the people of the colony to immediately erect and use the best latrines their ability and resources can produce; that these latrines be at once put under proper inspection; and that, as necessity demands and means and material permit, these temporary structures be replaced with others of approved design.

(4) That temporarily the hospital steward of the station ship perform the duties of sanitary inspector, and that the Bureau of Medicine and Surgery be requested to allow this station an additional hospital steward to be permanently assigned to this duty.

(5) Estimates were made of the amounts of money required for assisting, where necessary, towns in the construc-

tion of latrines and paying for other work under the board of health.

(6) Recommendations were made of sources from which these funds could be secured.

The Governor approved these recommendations and appointed a board of health to consist of the Captain of the Yard, the Senior Medical Officer and the Secretary of Native Affairs. The sum of $1,000 appropriated from the customs fund was made available January 1, 1910. The board was ordered to prepare for the consideration of the Governor health regulations following the recommendations of the special board together with suggestions looking toward the enforcement of these regulations. (Information supplied by Surgeon General, U. S. N. (See U. S. Naval Medical Bulletin, vol. 4, p. 476.)

Under recent date (1911) Dr. Rossiter advises that every inhabitant of American Samoa has been supplied with sanitary facilities.

STRAITS SETTLEMENTS.

1. **Distribution of infection.**—Dr. Milton Figart, Vice Consul General at Singapore, reports the infection as covering the entire Settlements. Infection is mostly agricultural; but little mining is done. Both *Necator americanus* and *Ancylostoma duodenale* are present, *Necator* predominating.

2. **Degree of infection.**—Investigations in the Settlements have been less extensive and thorough than in the Federated Malay States; Mr. Figart reports the following results of post-mortems at Tan Took Seng and the general hospital:

a. For 1908, number of post-mortems, 1,837; found infected, 13.3 per cent.

b. For 1909, number of post-mortems, 1,542; found infected, 8.3 per cent.

c. For 1910, number of post-mortems, 1,600; found infected, 10.6 per cent.

The general statement is made that infection in Straits Settlements is much less severe than in the Federated Malay States.

3. **Preventive measures.**—Estate managers are reported as taking some steps toward prevention in the form of better sewage disposal.

SUMATRA.

1. **Distribution of infection.**—Dr. J. Salm, colonial physician at Moeara, Tambesi, reports* that hookworm infection is widespread over the Island of Sumatra; that it is found among the natives of the interior who have never left the region and are still living in the savage state; that conditions clearly show that the infection was not introduced by European occupation.

2. **Degree of infection.**—Dr. Salm made 89 examinations at Moeara Tambesi and found an infection of 42 per cent. Of the natives examined 95.5 per cent were infected.

3. **Relief measures.**—No report on the subject.

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* Gaz. hebd. d. sc. méd. de Bordeaux, 1905, v. 26 (52), p. 615.

IV. AUSTRALIA.

AUSTRALIA.

1. **Distribution of infection.**—Reports from all parts of Australia indicate that infection is confined mainly to Queensland. In Queensland infection has been demonstrated in nearly all the principal centers on or near the eastern coast. These range, according to the report of I. S. C. Elkington, Commissioner of Public Health for Queensland, from Cairns and Port Douglas in the north to the Tweed River, 1,000 miles to the south. The principal centers of infection appear to be Cairns, Geraldton, Ingham, and Nambour. The disease does not appear to extend far back from the coast.

2. **Degree of infection.**—It is not possible to estimate accurately the degree of infection from data now available. Dr. Elkington reports that medical inspection of school children has failed to reveal anything like the results reported from the southern States; that an examination of the mines of Queensland has failed to reveal any clinical symptoms. Dr. T. F. McDonald reports* the disease as flourishing among the people of Johnstone River district (between Townsville and Cairns); that in one school he found 90 per cent of the children infected; that there are 5,000 people in this district that infection is present in every square mile of it, and that it is "sucking the heart's blood of the whole community." He reports a prevalent craving for dirt eating and numerous cases of severe moral degeneration.

* J. Trop. M., Lond., 1908, v. 11, p. 25.

3. **Source of infection and conditions favoring its spread.**—Dr. McDonald attributes the introduction of the disease into Australia to three sources: the South Sea Islanders, Arabians, Italians. He describes his district as a jungle of scrub 60 miles square; frost unknown; rainfall 200 inches.

4. **Relief measures.**—Ankylostomiasis has been a reportable disease since 1900; leaflets on the subject are distributed among the people; local authorities are advised on application concerning measures for the eradication of the disease.

It is proposed for the coming year to establish at Townsville a local staff under the state department of health to conduct systematic investigation of conditions of the disease in north Queensland; the Institute of Tropical Medicine at Townsville will cooperate.

V. EUROPE.

AUSTRIA.

1. **Infection in Austria.**—From the end of 1903 until March, 1907, hookworm disease prevailed as an epidemic in the coal fields of northwestern Bohemia, known as the Falkman and Brüx districts. Of 108,149 miners in 519 mines 34 cases of hookworm infection were reported. As a result of decisive action by the government the number of cases decreased rapidly from August 1, 1904, until March, 1907, when the disease entirely disappeared. A few cases were reported among persons not engaged in mines, but these were imported. In all there were 76 cases and one death from the time the disease was introduced into Austria until the country was declared free of the infection.

2. **Measures by which the infection was stamped out.**—The Imperial Ministry of Agriculture issued and enforced the following instructions:

(1) The mine must be kept clean and the floors of the galleries dry.

(2) Timbers of the mine must be whitewashed with lime.

(3) Rigid requirement that the workmen use the toilet rooms.

(4) An adequate supply of closets must be provided.

(5) Toilet rooms must be so constructed that there will be no leakage from the cesspool.

(6) Closets must be kept clean and odorless by the use of disinfectants.

(7) Mud must be removed from the galleries.

(8) Only drinking water known to be good must be used.

(9) Places must be supplied for washing. Eating with unwashed hands is forbidden.

(10) Anemic workmen must be kept under observation by the mine physician and their tools must be examined microscopically at intervals.

(11) When workmen from infected districts are engaged their tools must be microscopically examined.

(12) Workmen afflicted with hookworm disease must be treated by a physician and must not be allowed to return to work until completely recovered.

In 1904 additional regulations were issued by the Ministry of Agriculture, in conjunction with the Minister of the Interior, to prevent the reintroduction of the disease into Austria.

BELGIUM.

1. **Distribution of the infection.**—The infection exists chiefly among mine workers in the coal pits; it is found also among the brickmakers of the industrial parts of western and southern Belgium. The principal infection is in the districts of Liège, Mons, and Charleroi.

2. **Degree of infection.**—In 1904 the degree of infection among the workmen in the Mons district was 6.56 per cent; of the Charleroi district 14 per cent; of the Liège district 23 per cent. In 1910 the infection in the Liège district had been reduced to 5.3 per cent.

3. **What is being done to eradicate the disease.**—Belgium has the situation under control. The good results attained are attributed to the following measures:

(1) Obligation for every miner working underground to produce previous to his engagement and before going into

the pit a certificate of recent date showing that he is not infected with hookworm disease.

(2) Obligation for the employer to cause a second microscopic examination to be made of the workman's stool between the thirtieth and fortieth day after the first examination.

(3) Obligation to have periodical examination of all underground workmen on certain dates.

(4) Obligatory shower baths.

(5) The treatment of all persons found infected till cured.

BULGARIA.

Up to the present time (1911) no infection has been discovered in Bulgaria. The following measures have been approved by Dr. T. Pstrof, Inspector General of Public Health at Sophia, to prevent the importation of the disease into the country:

1. Mine operators are required as far as possible to permit none but native workers to enter the mines.

2. In case of admitting foreign workers, especially those who have worked in the mines of Austro-Hungary, a medical certificate from the country from which they came should be required certifying that the person is free from the disease.

3. Every foreign worker, preferably at the time of his admission, should be placed under observation with a microscopical examination of his fæces for two days. His clothes should be disinfected.

4. Twice a year submit all mine workers to medical examination and make microscopical examination of their stools for ancylostomiasis.

FRANCE.

1. **Distribution of the infection.**—Hookworm infection in France is confined to the mining population, the miners in the vicinity of Lyons and St. Etienne, and in the departments of Nord and Pas de Calais. In the mining region of southern France infection has been demonstrated in the departments of La Loire, Saone-et-Loire, Puy-de-Dome, Allier, Aveyron, and Gard.

2. **Degree of infection.**—The degree of infection varies from mine to mine; many mines are quite free from infection; others in the same region show an infection rate as high as 61.1 per cent, 64.28 per cent, 73.89 per cent (1908). The average for 2,708 miners examined in the mines of Gard, Tarn, Aveyron, Allier, Puy-de-Dome, and Saone-et-Loire was 7.2 per cent. This included many mines that were not infected.

3. **What is being done to eradicate the disease.**—Attention was centered on the matter in 1902 by the serious prevalence of the disease in Westphalia and in the mining district of Liège, Belgium. From the latter place miners were coming into the coal pits of Nord. In 1903 a semi-official investigation and an official investigation in 1904 demonstrated the infection in the mines of Nord and Pas de Calais and pointed to Belgium as the source of infection. Later investigations were made in mining regions of southern France. The Pasteur Institute at Lille, working under the auspices of the central committee of the coal mines of France, has carried on a vigorous attack from the first.

The following practical measures are being carried out:

(1) Every miner before being employed is examined; if infected he is not accepted.

(2) The sanitation of the mines by draining, ventilating, and supplying workmen with movable sanitary pails.

(3) Sanitary surface privies in the neighborhood of the mines.

GERMANY.

1. **Distribution of the infection.**—Infection exists in Rhineland, Westphalia, and the government district of Aachen (Aix-la-Chapelle). A few cases have been found among the brick workers in the vicinity of Cologne. It is confined to miners and brickmakers.

2. **Degree of infection.**—Investigations conducted in 1902 placed the infection in certain Westphalian mines at 19.5 per cent, 20 per cent, 34.14 per cent, 40 per cent, 50 per cent, 79 per cent. Since 1903 the degree of infection has been reduced 95 per cent.

3. **Measures for the relief and eradication of the disease.—**

(1) Institutes have been established for the examination and treatment of workmen.

(2) Every mine worker in infected mines is examined periodically.

(3) Miners found infected are isolated and treated until cured.

These measures have reduced the infection 95 per cent since 1903.

ITALY.

1. **Distribution of the infection.**—Hookworm disease is distributed over the whole of Italy, Sicily, and Sardinia.

It is found chiefly among farm hands, clay workers, and miners.

2. **Degree of infection.**—Statistics for even an approximate estimate of the degree of infection are not available. The Director General of Public Health at Rome reports: "Ancylostomiasis in Italy is frequent in Sicily and in Sardinia; it is rare in other regions." It has been estimated that about 15 per cent of the miners in the district of Palermo take the disease, but the American Consul at Palermo says: "This percentage is rapidly decreasing on account of the energetic measures adopted by both public and private agencies to eradicate the disease."

The infection in Italy seems to be relatively light.

3. **What is being done to eradicate the disease.**—The government has adopted the following measures:

(1) Free distribution to the working classes of a publication written in simple language and intelligible to the most modest intellects, giving practical advice as to the best methods of preventing and combating the disease.

(2) Distribution of circulars to all the prefects of the Kingdom, giving special instructions for the hygiene of workers in the manufacture of bricks and articles from clay. These special instructions are:

a. Avoid pools of stagnant water.

b. Meals to be eaten outside of work yards and clay beds to prevent infection of food.

c. Laborers must wash hands before eating.

d. Drinking water to be kept in closed receptacles.

e. Prevent soil pollution by providing closets and enforcing their use.

(3) For the protection of mine laborers all miners are required to be examined periodically and those infected are to be treated.

(4) An active surveillance by the marine sanitary officer of all immigrants landing from Brazil.

THE NETHERLANDS.

1. **Distribution of infection.**—Consul-General Listoe, at Rotterdam, reports that government investigation in 1904 revealed the presence of hookworm infection in the coal mines of Limburg, one of the southern provinces; that the infection has lately been demonstrated among the brickmakers of southern Limburg; that no infection has been found among agricultural workers.

2. **Degree of infection.**—The Government investigation of 1904 showed for the Limburg coal miners an infection of 21.74 per cent. Among the brickmakers the infection is reported at 14.4 per cent.

3. **Relief measures.**—For the coal mines the Government adopted stringent measures, excluding the infected from the mines. As a result of these measures the infection was reduced from 21.74 per cent in 1904 to 2.06 per cent in 1907. Regulations now in force provide for:

a. The sanitary disposal of all night soil in the mines.

b. The prevention of any carrier from entering the mines.

c. The free treatment and disinfection of the brickmakers. The worker is reimbursed for wages lost during treatment.

SPAIN.

1. **Distribution of the infection.**—The Director of Interior Sanitation of Spain, at Madrid, reports: "The country is infected. This malady affects, almost exclusively, the mining districts and is limited to the south of Spain." Robert Frazer, Jr., American Consul at Valencia, reports surface inspection in the township of Tabernes de Valldigna. He says: "The area of the infection is about 10 miles square. It is a warm, frostless belt, subjected too intensive cultivation and irrigation, and is noted for the production of strawberries and other early fruits as well as oranges, rice, peanuts, and table grapes. Dr. Rafael Pastor has treated five cases of hoookworm during the past two years, all originating from the same small area referred to. Some of the patients were sent to him by local doctors, who had been treating them for acute anemia."

2. **Degree of infection.**—The Director of Interior Sanitation reports: "In general the intensity is not great at the present moment, except in the mining region of Linares, where there are mines in which the number infected reaches 80 per cent of the total number of workers."

3. **Relief measures.**—On this point the report continues: "The public institutions have done nothing, nor have private agencies done anything so far as is known. Only Dr. Codina, of Castellani, has called the attention of the public authorities to the importation and gravity of this malady in Spain."

SWITZERLAND.

1. **St. Gothard tunnel epidemic.**—The well-known outbreak of hookworm disease among the workmen in the St.

Gothard tunnel (1879-1880) attracted public attention and caused the Swiss Government to institute an investigation. This investigation, conducted by Dr. Sonderregger, resulted in a system of sanitary regulations which freed Switzerland from the infection and has kept it free up to the present time (1911).

2. **Sanitary measures.**—These measures, which were rigidly enforced, provided:

(1) That all new tunnel workmen be carefully examined, and that if infected they be isolated, treated, and not permitted to go to work until all traces of infection had disappeared.

(2) That adequate sanitary closets be provided and that all workmen be required to use them.

(3) That bathing facilities be provided, and that all workmen be required to keep themselves clean.

Dr. Carrière, Acting Director of the Federal Department of Public Health, adds: "It is due to these precautions that during the building of the Simplon and Lötscheberg tunnels no case of ancylostomiasis was discovered."

WALES.

1. **Distribution of infection.**—There is no evidence of infection in Great Britain outside the tin mines of Cornwall.

2. **Control measures.**—A special report on anemia in the Dolcoath mine was made in 1902. The following preventive measures have brought the infection under control:

(1) Use of the sanitary pail under ground.

(2) Treatment of all infected persons.

(3) Education of the miners in preventive measures.

Forty-six Foreign Countries in Which the Infection is Widespread.

	Area (sq. mi.)	Population.
I. AFRICA:		
1. Algeria	184,474	4,739,556
2. British East Africa and Zanzibar	640	150,000
3. Egypt	400,000	9,734,405
4. Gold Coast Colony	40,000	474,000
5. Lagos and Yuraba	28,910	1,500,000
6. Natal	42,019	983,118
7. Sierra Leone	4,000	76,655
8. Tunis	51,000	1,900,000
II. AMERICAS, THE:		
9. Antigua	108	35,000
10. Barbados	166	195,588
11. Brazil	3,218,130	14,333,915
12. British Guiana	104,000	278,328
13. British Honduras	7,562	37,479
14. Colombia	473,202	3,593,600
15. Dominican Republic	18,755	417,000
16. Dutch Guiana or Surinam	46,060	67,128
17. Ecuador	116,000	1,205,600
18. French Guiana	30,500	32,908
19. Guatemala	48,290	1,747,000
20. Honduras	46,250	487,500
21. Jamaica	4,193	743,000
22. Martinique	381	164,000
23. Mexico	767,005	13,570,545
24. Nicaragua	49,200	380,000
25. Paraguay	157,000	432,000
26. Panama	31,571	285,000
27. Peru	463,747	2,660,881
28. Porto Rico	3,606	953,243
29. Salvador	7,225	1,006,848
30. Trinidad	1,754	253,000
31. Venezuela	593,943	2,323,527

	Area (sq. mi.)	Population.
III. Asia:		
32. Ceylon	25,333	3,578,333
33. China	4,277,170	426,047,325
34. Cochin China	23,160	2,400,000
35. India	1,766,642	294,361,056
36. Japan	161,198	46,453,249
37. Java	50,554	26,125,000
38. Korea	82,000	10,528,937
39. Malay States	26,500	676,000
40. Philippine Islands	114,326	7,000,000
41. Samoa	181	55,000
42. Straits Settlements	11,543	572,000
43. Sumatra	162,310	3,472,000
44. Turkish Province of Bagdad	54,503	850,000
IV. Australia:		
45. Queensland	668,497	503,266
V. Europe:		
46. Italy	110,550	32,475,253
Total	14,464,158	919,858,243

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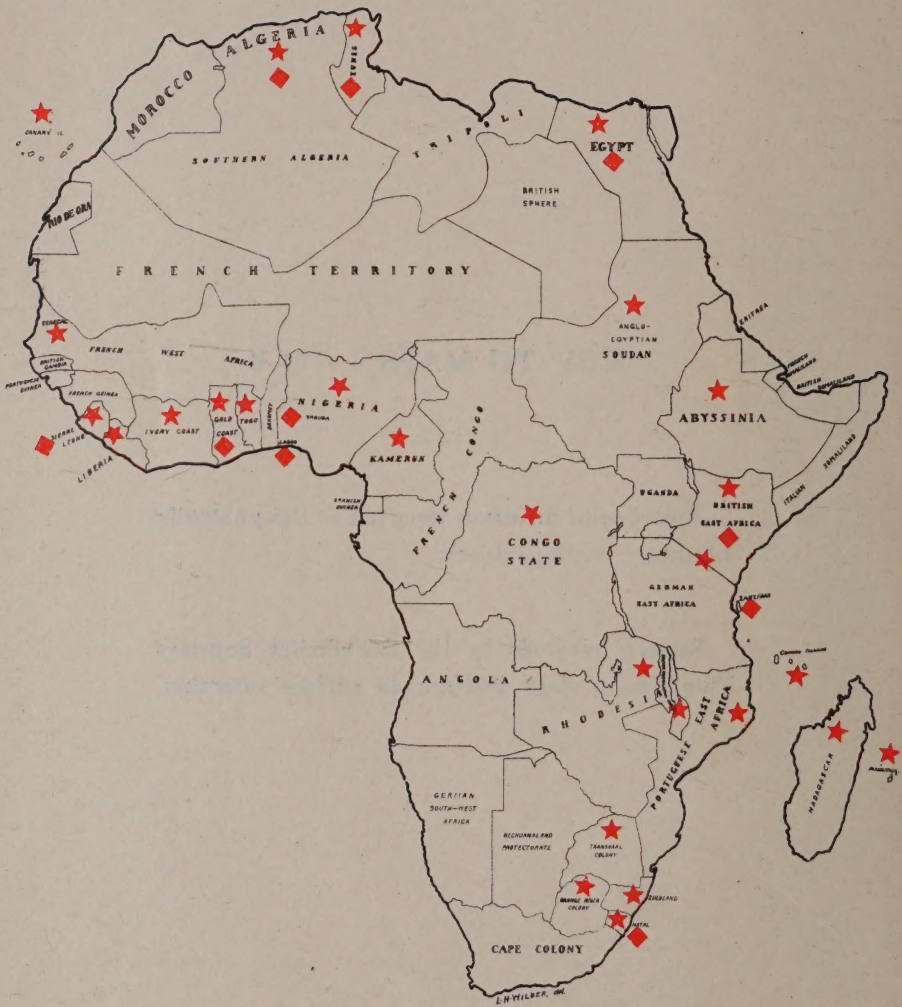
KEY TO MAPS 1 TO 6

Presence of infection reported in the published literature on the subject.

Reports received by the Rockefeller Sanitary Commission show widespread surface infection.

MAP No. I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EGYPT
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RIO DE ORO
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ANGLO-EGYPTIAN SOUDAN
ERITREA
ABYSSINIA
NIGERIA
KAMERUN
FRENCH CONGO
CONGO STATE
UGANDA
BRITISH EAST AFRICA
GERMAN EAST AFRICA
ITALIAN SOMALILAND
ANGOLA
RHODESIA
PORTUGUESE EAST AFRICA
GERMAN SOUTH-WEST AFRICA
BECHUANALAND PROTECTORATE
TRANSVAAL COLONY
ORANGE RIVER COLONY
ZULULAND
NATAL
CAPE COLONY
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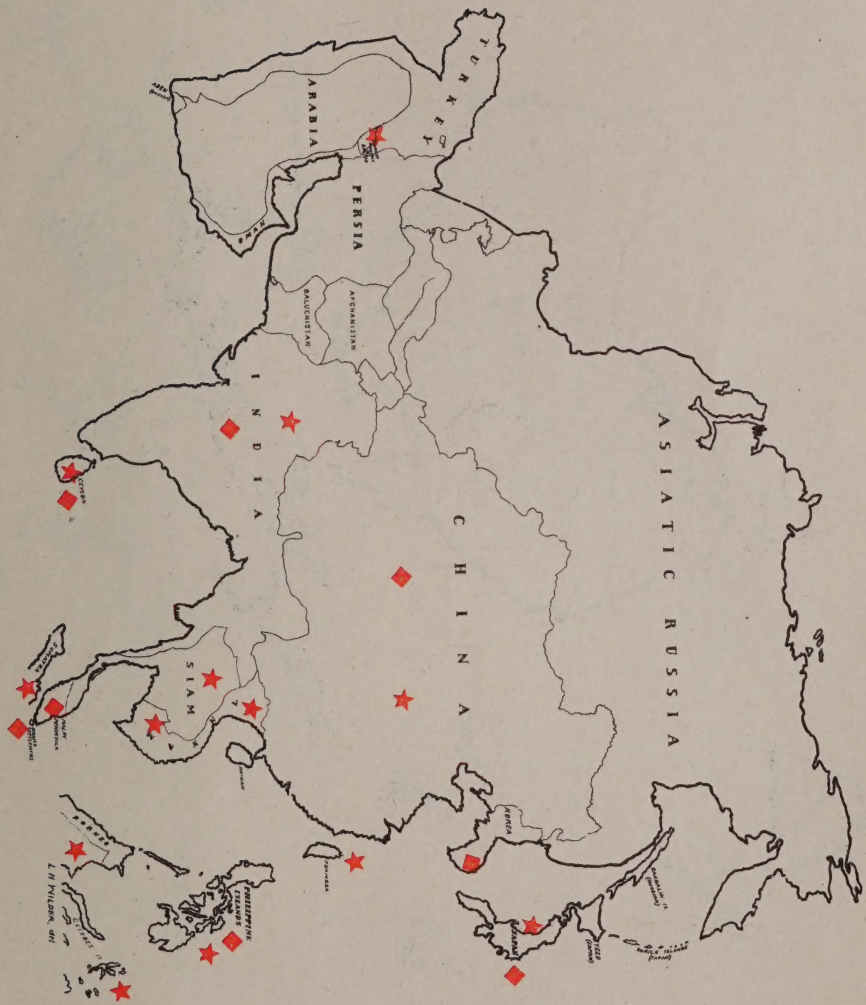
TOGO
DAHOMEY
L.H.WILDER, SM.

MAP No. 2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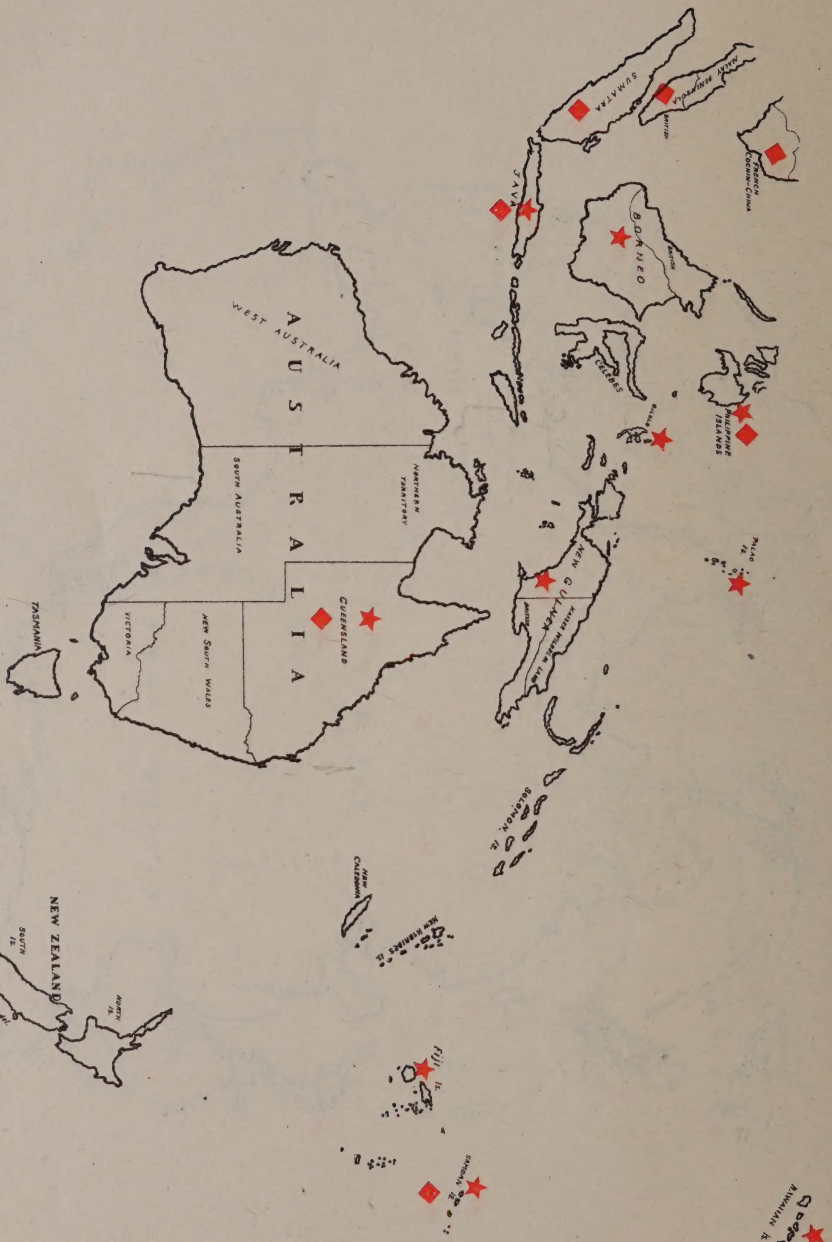
SIAM
PHILIPPINE ISLANDS
AFRICA

MAP No. 3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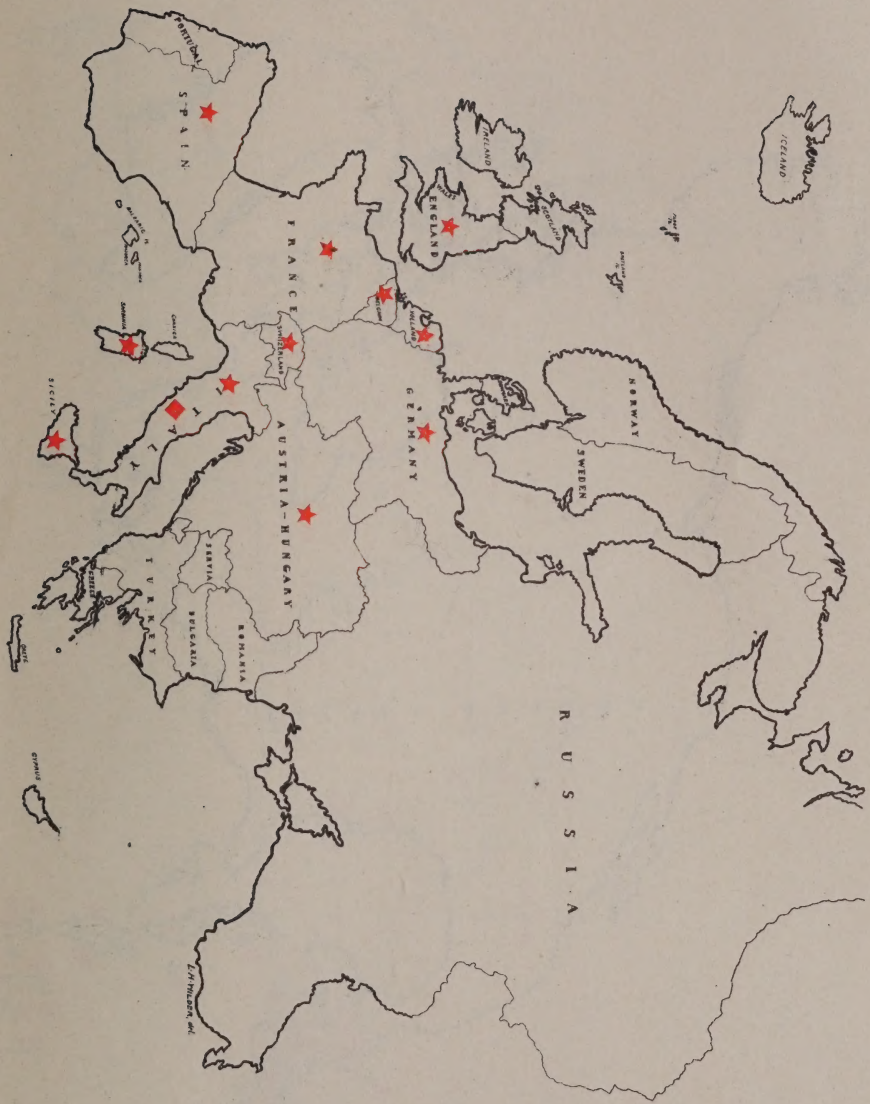
SOUTH AUSTRALIA
QUEENSLAND
NEW SOUTH WALES
VICTORIA
TASMANIA
NEW ZEALAND
SOUTH IS.
NORTH IS.
SUMATRA
BORNEO
CELEBES
PHILIPPINE ISLANDS
NEW GUINEA
SOLOMON IS.
NEW HEBRIDES
FIJI IS.
HAWAIIAN IS.

MAP No. 4


SPAIN
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IRELAND
ICELAND
GERMANY
AUSTRIA-HUNGARY
ITALY
SWEDEN
NORWAY
TURKEY
SERVIA
BULGARIA
RUMANIA
RUSSIA

MAP No. 5

GREENLAND
ALASKA
CANADA
UNITED STATES
MEXICO
CUBA
JAMAICA
HAITI
PUERTO RICO
HONDURAS
GUATEMALA
NICARAGUA
COSTA RICA
EL SALVADOR

MAP No. 6

BARBADOS
LEEWARD IS.
TRINIDAD
PANAMA
VENEZUELA
COLOMBIA
GUIANA
BRITISH
DUTCH
FRENCH
ECUADOR
BRAZIL
PERU
BOLIVIA
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